

RISK-TAKING AND PSYCHOSOCIAL  
FUNCTIONING OF ADULTS WITH  
ATTENTION-DEFICIT/ HYPERACTIVITY  
DISORDER

---

A thesis submitted in partial fulfilment of the requirements

for the Degree

of Doctor of Philosophy

in the University of Canterbury

by Mairin Rose Taylor

University of Canterbury

2012

---

## Acknowledgments

I wish to express my sincere gratitude to Dr Julia Rucklidge for her ongoing support and patience throughout this project. Julia's enthusiasm in the field of ADHD has been infectious and her professional and personal guidance have been invaluable both in my completing this thesis and in life in general in the past few years. Sincere thanks are also extended to my secondary supervisor, Dr Roeline Kuijer whose patience and encouragement are gratefully acknowledged. The completion of this thesis following a challenging 2011 in Christchurch was also made possible by the generous assistance of Dr Joseph Boden, Christchurch School of Medicine; whose statistical expertise was timely and gratefully accepted. Thanks also to Jason Brown, Sarah-Eve Harrow and Rachel Harrison, for their valuable collaboration.

I would also like to acknowledge the patience and generosity of every person who participated in this research. I hope that this research contributes in some way, to communicating the service needs of adults with ADHD. These courageous participants are the point of this whole project.

I would like to gratefully acknowledge the financial support that has enabled the completion of this project and also allowed me to disseminate my findings at various conferences, including; a University of Canterbury Doctoral Scholarship, a Claude McCarthy Fellowship, a Department of Psychology Conference grant, and a

Canterbury Medical Research Foundation Travel Grant. This assistance has been much appreciated.

Thanks and gratitude is also extended to all my family and friends, especially Mum and Geoff, Liam, the Joneses and my North Island whanau. Your combined support has been crucial. I would especially like to thank Mike for his unending strength and gentle support, whose belief in me has sustained me throughout this whole process. Thanks and appreciation also go to my precious daughter Neve, who was born part-way through this project and gave new meaning to the past few years and has thankfully has not suffered too greatly from sharing a parent with a PhD.

Finally, I would like to acknowledge all those we have lost over the past years, especially my father, Neville Barry Taylor; Rowan Jones; Uncle Bob; Nana Taylor and Glenn. Also...My heart is with you Christchurch.

## Table of Contents

Acknowledgments .....	i
Table of Contents .....	iii
List of Tables.....	vi
List of Figures .....	vii
List of Appendices .....	viii
Abstract .....	ix
1. INTRODUCTION .....	1
1.1 Overview .....	1
1.2 ADHD and Pathology.....	3
Definition and Classification of Adult ADHD .....	3
ADHD Subtypes .....	9
Difficulties with ADHD Diagnosis .....	16
1.3 Developmental Outcomes Associated with ADHD .....	22
Executive Dysfunction.....	22
Motivation .....	25
Adaptive Functioning.....	29
Psychological Adjustment .....	38
Risk-Taking.....	42
1.4 Theoretical Models of Adult ADHD and Risk Taking.....	53
An Integrated Model of Adult ADHD and Risk Taking.....	56
1.5 Rationale and Hypthoses for Emprical Research.....	60
2. METHODS .....	63
2.1 Participants.....	63

Retention and Adherence.....	66
2.2 Measures .....	68
2.3 Experimental Measures .....	79
2.3 Procedures .....	83
Statistical Analysis.....	85
3. RESULTS .....	91
3.1 Sample Characteristics.....	91
3.2 Descriptive Statistics.....	92
3.3 Analysis of Confounding Variables .....	95
3.4 Item Analyses.....	96
Phase I: Adult ADHD and Self-Destructive Behaviours.....	96
Phase II: Motivational Variances and Risk Taking in Adult ADHD.....	105
Phase III: Psychological Outcomes Associated with ADHD and Comorbid Child Abuse Victimization .....	114
Phase IV: Adult ADHD and Physical Health Outcomes .....	120
4. DISCUSSION .....	122
4.1 Summary of Empirical Findings .....	122
Phase I: Adult ADHD and Self-Destructive Behaviours.....	122
Phase II: Motivational Variances and Risk Taking in Adult ADHD .....	126
Phase III: Psychological Outcomes Associated with ADHD and Comorbid Child Abuse Victimization .....	133
Phase IV: Adult ADHD and Physical Health Outcomes .....	137
4.2 General Limitations .....	139
4.3 General Summary .....	142

Clinical Implications .....	144
Conclusion.....	147
 5.0 BIBLIOGRAPHY .....	 149

## List of Tables

Table 1: Descriptive Statistics Incl. Rates of Life-Time Psychiatric Disorders.....	92
Table 2: Bivariate Associations between ADHD and Confounding Variables.....	95
Table 3: Bivariate Associations between ADHD and Self-destructive Behaviours.....	97
Table 4: Bivariate Associations between Psychosocial Mediators and Self-destructive Behaviours.....	97
Table 5: Bivariate Associations between ADHD and Risk-Taking Behaviours.....	107
Table 6: Bivariate Associations between Mediating Variables and Risk-Taking Outcomes.....	108
Table 7: Childhood Trauma Responses by Group.....	116
Table 8: Bivariate Associations between ADHD and Psychological Outcome Variables.....	117
Table 9: Bivariate Associations between Moderator and Outcome Variables.....	117
Table 10: Bivariate Associations between ADHD and Physical Health Outcomes.....	121

## List of Figures

Figure 1: Biopsychosocial Model of Risk-taking Behaviour in ADHD.....	58
Figure 2: Mediation Model Showing the Direct and Indirect Pathways between ADHD and Self-harm Behaviours.....	99
Figure 3: Mediation Model Showing the Direct and Indirect Pathways between ADHD and Suicidal Ideation.....	101
Figure 4: Mediation Model Showing the Direct and Indirect Pathways between ADHD and Suicidal Attempts.....	103
Figure 5: Total Mediation Model Showing the Pathways between ADHD and Self-destructive Behaviours.....	104
Figure 6: Mediation Model Showing the Direct and Indirect Pathways between ADHD and Violence Risk.....	110
Figure 7: Mediation Model Showing the Direct and Indirect Pathways between ADHD and Nicotine Risk.....	112
Figure 8: Moderated Mediation Model Showing the Direct and Indirect Pathways between ADHD and Psychological Outcomes via Abuse Victimization.....	119

## List of Appendices

Appendix 1: Study Information Sheet and Consent Form.....	172
Appendix 2: Invitation to participate/ Advertisements.....	178
Appendix 3: Personal History Questionnaire.....	183
Appendix 4: Adapted SLÁN Health and Lifestyle Questionnaire (Dept. of Health and Children, Dublin, Republic of Ireland, 2002).....	186
Appendix 5: The ART-Q: Adult Risk Taking Questionnaire.....	201

## ABSTRACT

ADHD is a persistent psychological disorder with far-reaching effects on many facets of an individual's development. Despite this, there are a number of developmental outcomes that have not been extensively researched. Among these topics; is whether there is a risk of harm that may be inherent in life-course persistent ADHD symptomatology.

Based on an integrated theory of ADHD phenotypology; this thesis contains a study comprising of four phases that explore the relationship between ADHD and four risk-laden outcomes. The sample for this study consisted of 67 adults from Christchurch, New Zealand (average age 33) of whom a sample of 35 adults met criteria for ADHD, which persisted into adulthood. The group of adults with ADHD were matched across demographic factors with a control group of adults with whom they were compared across a raft of psychosocial variables. The first phase illustrates the relationship between ADHD and self-destructive behaviours including self-harm and suicidal ideation and attempts, which were found to be significantly mediated by coping behaviour and psychological comorbidity. The second phase reports on the relationship between ADHD and a range of risk-taking behaviours including: violence risk, nicotine use and sexual risk-taking, and the mediating role of motivational variances, including reward sensitivity and temporal discounting. The third phase illustrates the moderating

effect of childhood abuse victimisation on ADHD in increasing the vulnerability of the development of mood disorders in adulthood. A fourth phase explores a range of physical health outcomes including diet, exercise, chronic illness and disability which were not found to be significantly associated with ADHD in adulthood.

Based on the literature previewed below, it is theorised in this thesis that ADHD symptomatology may act as a diathesis that, coupled with comorbid psychosocial stressors, may contribute to an individual's level of risk to themselves and others. Overall, this research suggests that ADHD symptomatology that persists into adulthood may pose a significant risk to some individuals, in the form of deliberate and non-deliberate forms of harm. These findings may challenge previously held beliefs regarding the innocuousness of ADHD as a psychological disorder and highlight the need to consider risk and safety issues in the assessment and treatment of adult ADHD.

## INTRODUCTION

### 1.1 Overview

Attention-Deficit/ Hyperactivity Disorder (ADHD) is a chronic and potentially disabling psychological disorder characterized by inattention and impulsivity/ hyperactivity (DSM-IV-TR; American Psychiatric Association, 2000). ADHD affects an individual's ability to access and store information, regulate their behaviour and adapt effectively to their environment (Barkley, 2008). These attentional difficulties often lead to significant impairment in academic, occupational and inter- and intra-personal functioning. The consequences of such developmental difficulties include much higher rates than the general population of substance abuse disorders, anxiety disorders, major depressive disorders, psychosis and antisocial disorders, including criminality (Biederman et al., 2006). These findings indicate that experiencing significant attentional problems as an adult may be a risk factor for a range of outcomes that negatively affect both the individual and society. There is already limited research to suggest that *children* and *adolescents* with ADHD engage in high-risk behaviours such as dangerous alcohol and drug use (Biederman et al., 1998) and that they are at an increased risk of accidental injuries, such as burn injuries and traumatic brain injuries (Mangus et al., 2004; Merrill et al., 2009). However, significant research gaps in our knowledge exist, regarding the

extent to which individuals with ADHD place themselves at greater risk of illness or injury in *adulthood*. A limited number of studies have indicated that adults with ADHD may engage in a higher frequency of: substance abuse, smoking (Pomerleau et al., 2003; Biederman et al., 2006), sexual risk taking (Barkley and Gordon, 2002) dangerous driving (Barkley et al., 2005) and possibly suicide (James et al., 2004). Given the associated difficulties with self-regulation, impulsivity and comorbid psychopathology, individuals with ADHD may be at an increased risk of engaging in or experiencing high-risk behaviours.

This following section describes the classification of ADHD, associated psychopathology and high-risk phenomenology, all within a framework of a biopsychosocial model of ADHD, which in turn provides the theoretical justification for this thesis.

## 1.2 Attention-Deficit/ Hyperactivity Disorder and Pathology

### *Definition and Classification of Attention-Deficit/ Hyperactivity Disorder*

Attention-Deficit/ Hyperactivity Disorder (ADHD) is defined in the current fourth edition text-revision Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association, 2000) as a persistent and pervasive neurobehavioural developmental disorder characterized by inattention and/or impulsivity and hyperactivity evidenced before 7 years of age. An individual presents with a number of attentional difficulties and crucially, impairment across different settings; social, academic and domestic; corroborated by multiple informants, such as teacher, parent and coach. These attentional symptoms cluster around 3 main subtypes: ADHD, Combined Type; ADHD, Predominantly Inattentive Type; and ADHD, Predominantly Hyperactive Type. Diagnosis is made depending on the number of symptoms reported (6 or more) in either the Hyperactive/ Impulsivity category or the Inattention category, or, in the case of ADHD Combined Type, the criteria is 6 or more symptoms from both categories. The DSM-IV-TR also includes a fourth category, that of ADHD Not Otherwise Specified (ADHD-NOS) for individuals who do not meet the number of criteria in either category, but for whom attentional problems are causing significant impairment. Classification and diagnosis of ADHD is notoriously difficult, as the judgment of 'abnormal' development must take into account the age-appropriate

levels of distractibility and impulsivity of same-aged peers, as well as potentially confounding factors such as an individual's intellectual ability or learning disabilities, along with levels of stability in the home and parental influences. Therefore, evidence of continuity of symptoms is all the more important, as assessed using multi-modal, multi-informant methods that elucidate symptoms across time (more than 6 months) and across different settings. The assessment of adults for ADHD is often necessary as a number of individuals are not assessed as children. This can occur for various reasons such as lack of funding at schools, lack of awareness among parents or teachers, social factors such as family transiency, as well as socio-cultural factors such as the possibility that for some generations, attentional problems in childhood were misrepresented as intentional misbehaviour.

Using the current DSM-IV-TR ADHD criteria for the assessment of adults involves 'translating' the childhood symptom into an adult context. For example, the symptom "often leaves seat in classroom or in other situations in which remaining seated is expected" can be translated to: often leaves seat (difficulty staying seated throughout a movie, lecture or prefers to do active things) (Johnson & Conners, 2000). However, such a 'translation' of the childhood criteria is reliant on clinician interpretation and is therefore far from standardized. Some have argued for the classification of adults with ADHD using a reduced number of the DSM criteria (4 or 5 of 9 respectively), arguing that the current 6 of 9 cut-off is too stringent, does

not reflect developmentally-grounded impairment in adults and results in a population of very severely affected adults far smaller than the generally accepted 4-5% prevalence rates of ADHD (Murphy & Barkley, 1996; Heiligenstein et al., 1998). However, the use of a reduced number of criteria for adults has not been extensively adopted as yet. In order to be consistent with a standardized approach to the classification of ADHD in adults, the research described in this thesis maintains the use of the standard 6 of 9 criteria of the DSM-IV.

At the time of writing, changes to the adult ADHD criteria have been proposed in the soon to be published DSM-V. According to the current draft document, changes to the criteria for older adolescents and adults may include: lowering the threshold from 6 of 9 criteria to 4 endorsed criteria; using examples of problematic behaviour that correspond to the criteria that involve situations within an adult context, such as work performance, household chores, time management, paying bills; increasing the age of onset from age 7 to age 12 and evidence of *several* symptoms needed before this age, as opposed to *all* of the criteria (DSM-5 Draft, APA, 2010). In general, these changes may result in both greater clarity for the classification of ADHD in adults as well as increased reliability and validity in applying the criteria to an adult context. It is uncertain at this stage, whether the proposed changes may result in an increase or decrease in the number of adults meeting criteria for ADHD.

Current prevalence rates for ADHD ranges from between approximately 3-7% of school-aged children (DSM-IV-TR; APA, 2000). Although the condition has generally been viewed as a disorder of childhood (and the large majority of research relates to children), approximately two thirds of children with ADHD continue to be significantly impacted by ADHD symptomatology in adulthood (Biederman et al., 2006). Although adult ADHD prevalence rates in New Zealand have not been extensively measured, international prevalence rates in conjunction with the proportion of ADHD persistence, equates to a conservative estimate of about 88,000 New Zealand adults with clinically significant ADHD (2-3%)<sup>1</sup>.

In terms of the extent of the effects of ADHD, a number of important life domains are significantly affected, often compounding each other in a chronic manner. It could be argued that there are few psychiatric disorders that result in such persistent and wide-spread impairment. There are several commonalities to the areas of impairment in ADHD across the lifespan. In childhood, these domains include educational difficulties such as missed or incomplete school work, often progressing to delays in achievement. Problems with schooling are often the first and most widely reported area of impairment for individuals with ADHD, followed by difficulty fulfilling domestic responsibilities such as completing chores (Barkley,

---

<sup>1</sup> Based on estimated resident New Zealand population (aged 20 and over), Statistics NZ. Downloaded from <http://www2.stats.govt.nz/domino/external/pasfull/pasfull.nsf/7cf46ae26dcb6800cc256a62000a2248/4c2567ef00247c6acc25710a00059d0f?OpenDocument> on 21<sup>st</sup> April 2006.

Murphy & Fischer, 2008). Educational achievement continues to typically be affected into adulthood for the majority of individuals with ADHD and not surprisingly this educational impairment flows onto and probably, contributes to, occupational impairment when adults enter the workforce. In addition, individuals with attentional problems tend to have significant levels of difficulty in adulthood with maintaining interpersonal relationships, higher parental stress, problems with financial management, and difficulties with daily organisation and everyday responsibilities (Barkley, Murphy & Fischer 2008).

Despite these commonalities in the course and development of ADHD across the lifespan, there is also variance within the disorder, particularly in relation to the classification of ADHD subtypes in adults. It has been noted that individuals with different subtypes of ADHD can vary quite significantly in their presentation and the domains of impairment (Gibbins et al., 2010). For example, an adult with Combined Type ADHD may present at work with more restlessness, and overtly impulsive and disruptive behaviours as opposed to an adult with Inattentive Subtype ADHD, who may present at work with less obvious difficulties such as a lack of focus, daydreaming or 'absence' and difficulty with organising their behaviour. An issue for the diagnosis of ADHD in adulthood is the fact an individual's developmental course of ADHD may be relatively fluid, with evidence that hyperactive-impulsive symptoms tend to reduce over time, while inattentive

symptoms tend to be more stable across the lifespan (Mick, Faraone & Biederman, 2004). Faraone et al., (1997) have suggested that the current DSM subtypes may in fact reflect developmental stages of ADHD, rather than distinct phenomena. This change in symptom dimensions across the lifespan leads to the quandary of whether an individual is diagnosed with Combined Type ADHD (which they met criteria for in childhood) or Inattentive Type (which they may now meet criteria for in adulthood). There is little guidance in the DSM-IV-TR on how to resolve this issue. In the research reported in this thesis, adults have been diagnosed with the subtype for which they meet criteria as adults. The reasoning for this decision is that firstly, this research focuses largely on adaptive functioning in adulthood; therefore the type of symptoms experienced in this life-stage would be more pertinent than those experienced in childhood. Secondly, given the well-known effect of recency on biographical recall (particularly in ADHD) (Mannuzza et al., 2002), the more recent subtype profile may be a more reliable diagnosis. Below are brief summaries of the course, presentation and classification of the three main subtypes of ADHD; ADHD, Predominantly Hyperactive-Impulsive Type; ADHD, Combined (Hyperactive-Impulsive) Type and ADHD, Predominantly Inattentive Type.

*ADHD Subtypes**ADHD, Predominantly Hyperactive-Impulsive Type: ADHD,*

Predominantly Hyperactive-Impulsive (ADHD-HI) is characterised by significant impairment across a number of contexts associated with symptoms such as:

fidgiting and difficulty staying seated, internal restlessness, difficulty with remaining still or quiet, and verbal and behavioural impulsivity (APA, 2000).

According the DSM-IV-TR, individuals must meet 6 of these 9 criteria for more than 6 months to meet a diagnosis of ADHD-HI, in addition to meeting less than 6 inattention criteria (APA, 2000). Hyperactive-Impulsive symptoms in ADHD tend to develop earlier than inattentive symptoms, often during preschool-age years (Loeber et al., 1992). As such, Murphy et al., (2002) have suggested that the Hyperactive-Impulsive (H-I) dimensional symptoms may act as a kind of precipitant to later inattentive symptoms, which tend to arise during school-aged years for those who later develop ADHD, Combined Type. Individuals who continue to experience significantly impairing H-I symptoms (without inattentive symptoms) are the minority among those with ADHD. Only approximately 9% of children and only 2% of adults diagnosed with ADHD meeting criteria for this subtype (Biederman et al., 1993; Millstein et al., 1997). Although there are many consistencies across the subtypes in terms of psychosocial impairment and rates of psychological comorbidity (e.g. Murphy et al., 2002), there are also indications that there may be

significant differences between the experiences of those with a majority of H-I symptoms over inattentive symptoms. For example, Sprafkin et al., (2007) found that adults whose ADHD symptoms cluster around the H-I dimension tend to have higher rates of comorbid Oppositional Defiance Disorder, Conduct Disorder and Obsessive-Compulsive Disorder and that this dimension was more closely associated with mania (although the overlap between mania and hyperactivity can make this finding problematic).

*ADHD, Combined Type:* ADHD-Combined Type (ADHD-C) in adulthood is characterised by both inattention- type difficulties such as distractibility, difficulty with sustaining attention and concentration; in addition to hyperactive-impulsive difficulties, such as internal restlessness, and always being ‘on-the-go’ as if driven by a motor (Epstein, Johnson, & Conners, 2002). As such, the overarching characteristics of individuals with ADHD-C seem to be significant difficulty with regulating the level and type of stimuli and reinforcement they respond to, associated with difficulty with regulating and controlling their behaviour. Individuals with ADHD-C account for approximately 60% of the number of children diagnosed with ADHD versus 31% with Predominantly Inattentive Subtype (Biederman, 1997). This proportion drops markedly in adulthood with some studies suggesting prevalence rates of approximately 56% of ADHD adults

with ADHD-C versus 37% with ADHD-Predominantly Inattentive-Type (Millstein et al., 1997).

This reduction in hyperactive-impulsive symptoms over time reflects a current problem in the classification of ADHD-C in adults. A significant number of individuals that formerly met criteria for this subtype in childhood, no longer meet DSM criteria in adulthood for ADHD-C but continue to meet criteria for the Predominantly Inattentive subtype, demonstrating a seeming higher stability of inattentive symptoms across the lifespan (Biederman, Mick & Faraone, 2000). The current DSM classification system does not give clear guidance on whether an individual should be diagnosed with the ADHD-C they met as children, or with the ADHD-Predominantly Inattentive Type they meet as adults (particularly when such adults are still impacted by sub-clinical levels of hyperactive-impulsive symptoms). This reduction in hyperactive-impulsive symptoms may be due to individuals being more likely to 'out-grow' or adapt to hyperactive symptoms as they grow older, or alternatively, the current DSM-IV classification system may not be accurately measuring hyperactive symptoms in adulthood, which may be different in quality from childhood symptoms, but similarly impairing. This is supported by the Milwaukee and UMASS (University of Massachusetts Medical School) longitudinal studies which have found that ADHD criteria that incorporated 4 of 9 DSM hyperactive-impulsive symptoms in adulthood (plus an emphasis on impairment), as

opposed to 6 of 9 symptoms, resulted in a much smaller reduction in the relative rate of ADHD-C individuals in adulthood. In addition, these criteria resulted in a base rate of ADHD in adulthood that was proportionately similar to the rate found in childhood. This equated to a 93<sup>rd</sup> percentile cut-off, as opposed to a 99<sup>th</sup> percentile cut-off found when the full DSM-IV criteria were used (Barkley, Murphy & Fischer, 2008).

The importance of accurate diagnosis of the ADHD subtypes in adulthood relates to the potential that there may be differential outcomes for adults with the different subtypes of ADHD. There is persuasive evidence for the external validity of the two dimensions of ADHD (inattention and hyperactivity-impulsivity) and their relative influence on the developmental course of an individual with ADHD (Lahey et al., 2005). For example, if an individual retains significantly impairing hyperactive-impulsive and inattentive symptoms into adulthood (ADHD-C), this combination of the two dimensions often leads to global levels of impairment across the lifespan. Individuals with any of the ADHD subtypes are more impaired than adults without ADHD, in settings which specifically require concentration and sustained attention (such as school, vocational training and work) and experience higher rates of comorbid psychiatric and substance abuse disorders (Murphy et al., 2002). However, individuals with ADHD, Combined Type appear to be additionally impaired in terms of comorbid symptom severity, interpersonal

functioning, externalising and suicidal behaviours (Sprafken et al., 2007; Murphy et al., 2002). This is not to suggest necessarily, that ADHD Combined Type is a more severe form of ADHD and therefore more impairing, although there is some literature to suggest this (Sprafkin et al., 2007). But certainly the scope of impairment seems to be wider and therefore, the *potential* for impairment may be greater for individuals with ADHD Combined Type.

*ADHD, Predominantly Inattentive Type: ADHD-Predominantly Inattentive Type (ADHD-PI)* is characterised by difficulties with sustaining attention, distractibility, procrastination, difficulty completing tasks, disorganisation and forgetfulness (Epstein, Johnson, & Conners, 2002). Although still occasionally referred to or recognised, as “Attention Deficit Disorder” (ADD), this classification was changed to its present form in 1987 with the introduction of the Revised Third Edition of the Diagnostic and Statistical Manual (DSM-III-R). While the symptoms of the Hyperactive-Impulsive dimension seem to involve more externalising behaviours and may therefore be more obvious to an observer, the Inattention symptoms referred to in the current DSM system largely refer to difficulties with internal regulation or processing. As a result Milich et al., (2001) have proposed that ADHD-PI be classified on its own among the internalising disorder, as opposed to among the disruptive behaviour disorders as in the current DSM system (APA, 2000). These difficulties may be less apparent to an observer such as a teacher,

parent or spouse. As such, ADHD-PI tends to be more difficult to assess in children, due to less overtly disruptive behaviours, particularly in the classroom. Children with ADHD-PI tend to engage in daydreaming and ‘window-gazing’ in a classroom and their academic difficulties can often go unnoticed; as opposed to those engaging in more externalising behaviours that are more commonly seen with H-I symptoms. Similarly, in adulthood, ADHD-PI seems to be characterised by difficulty with regulating internal states or behaviour rather than overtly disruptive or externalising. In adults as in children, these difficulties may be more noticeable in terms of the *consequences* of their attentional difficulties. In ADHD-PI, a crucial aspect of assessment is an individual’s level of productivity or output in the workplace or home as a consequence of difficulties with organisation, maintaining focus and completing tasks, etc.

In childhood, girls tend to be more likely to be diagnosed with inattentive rather than hyperactive-impulsive symptoms (Faraone et al., 1998). This may be due to the aforementioned overlap between ADHD-PI and internalising behaviours and the lower frequency of externalizing behaviours among girls. Or perhaps the currently used diagnostic tools do not accurately encompass the kind of attentional difficulties that girls may experience (Gaub & Carlson, 1997). In adulthood, there is mixed evidence regarding whether this gender effect continues to be as significant. For example, Sobanski et al., (2008) and Barkley et al., (2008) did

not find a gender effect in relation to inattentive symptoms. It is possible that any gender differences in adulthood may be camouflaged by the overall reduction in hyperactive-impulsive symptoms in adulthood as mentioned above.

Despite some differences found between the ADHD subtypes in terms of developmental trajectories and impairment as mentioned above, there are a number of generalities that apply to ADHD. The following sections will review relevant literature in terms of the scope and level of impairment associated with ADHD in adults. Current controversies around the diagnosis of ADHD will be briefly discussed and the relevance of diagnostic variables for treatment of ADHD. In addition, theoretical underpinnings of ADHD will be discussed, particularly in regard to an explanatory model of the developmental outcomes discussed and, risk taking behaviours that are included in these outcomes.

*Difficulties with ADHD Diagnosis*

Controversies exist within the field of psychological and medical management of ADHD. These include growing concern with the increasing rates of diagnosis and pharmacological treatments of ADHD. The growing awareness of ADHD and the de-stigmatization of ADHD in Western societies may be related to an increase in diagnosis among individuals (Tuckman, 2007). Whilst rates of the diagnosis of adults with ADHD (4.7%) may still be well within what would be expected from the estimated rates of persistence into adulthood (2/3 according to Biederman et al., 2006); the rate of diagnosis of children is increasing significantly. Whilst research suggests prevalence rates of 3-7% of school age children meeting criteria for ADHD (DSM-IV-TR; APA, 2000) some areas in the United States of America are recording diagnosis rates increasing more than 30% within the decade from 1998-2008 to prevalence rates of nearly 9% (Boyle et al., 2011).

With an increase in diagnosis of ADHD, one could argue there may be an associated increase in public awareness of the disorder. Some of the key aspects of public understanding of ADHD have evolved from the perceived 'biological' nature of ADHD. This may be partly due to the fact that ADHD has been found to have a 'relatively' high rate of heritability, and because many individuals respond dramatically to psychostimulant treatment (Diller & Goldstein, 2006). This is associated with a de-emphasis of the psychosocial influences of ADHD. For

example, a major adult ADHD advocacy and support website in the U.S suggests strongly that:

“ADHD IS very likely caused by biological factors [and that] ADHD is NOT caused by poor parenting, family problems, poor teachers or schools.”<sup>2</sup>

Diller and Goldstein (2006) argue that since much of the last few decades in psychology have been spent ‘de-bunking’ the role of ‘the mother’ as the psychodynamic root cause of much psychological dysfunction, the pendulum has swung in the other direction and the importance of parenting in general and early learning environments have been greatly minimized.

This minimization of the role of psychosocial factors may not just be evident in the perception of the public. Due to a the high level of perceived heavy influence of genetic factors on the aetiology of ADHD, there appears to have been a de-emphasis of psychosocial aetiological factors in ADHD among health professionals and researchers (Diller and Goldstein, 2006). The consequence of this de-emphasis means that not only are potentially crucial aetiological factors not considered fully in research (e.g., parenting, environmental enrichment, traumatic events, acquired brain injury) but also the treatment modalities employed for ADHD may not adequately address these psychosocial variables. For example, whilst the effectiveness of

---

<sup>2</sup> See [http://www.add.org/?page=ADHD\\_Fact\\_Sheet](http://www.add.org/?page=ADHD_Fact_Sheet), downloaded 14 March 2013

psychostimulant treatment for some individuals is unquestioned, the sole use of pharmacological treatments have been less effective in individuals with ‘complicated ADHD’ ([the norm] whereby individuals experience co-morbid oppositional defiance disorder, anxiety disorders, etc.) (Conners et al., 2001). Regardless of whether stimulant or psychosocial treatments are *more* effective, they have both been found to be effective. Based on this point, and the fact that long-term effects of psychostimulant treatment for children is uncertain at best, Diller and Goldstein (2006) argue persuasively on the importance of scientific *and* ethical considerations in treatment planning for children.

Among adults, psychostimulant treatment may be even less of a panacea, as compliance rates are reported to be as low as 50% (Darredeau et al., 2007). These low rates of compliance may perhaps due to the finding that psychostimulant treatments in adults similarly appear to have little effect (or little positive effect) on associated anxiety, depression, bipolar disorders (Bederman & Spenser, 2000); arguably the reasons why many adults with ADHD would seek treatment in the first place. In addition, if such a strong emphasis is placed on the ‘biological’ influences on ADHD, there may also be an associated reduction in the perception of ‘free- will’ or empowerment among those with ADHD and their parents. In fact, if ADHD is viewed by lay people as a neurological disorder there may also be a belief that it is therefore fixed and unchangeable (except for medication therapies). Perhaps this

may partially explain why few psychosocial therapies have been employed or tested in the treatment of ADHD. This is despite the fact that there is some evidence for the effectiveness of these therapies (e.g., Aberson, Shure & Goldstein, 2007; Chako et al., 2005), which conflicts with earlier reports to the contrary (Abikoff, Howard et al., 2004).

If ADHD were viewed as a neurobehavioural ‘syndrome’ with various forms of expression (ADHD subtypes) and various aetiologies, this would enable scope for theoretical models and treatments that have greater sensitivity for these various aetiologies and subtypes. For example, there is growing evidence of a significant minority of individuals with ‘acquired ADHD’. These individuals may have developed normally until some kind of neurological insult (e.g., chemotherapy, traumatic brain injury, encephalitis, etc.) resulted in neurobehavioural difficulties that fit then the criteria for ADHD (see Nigg, 2006). Whilst these individuals may appear to have very similar symptoms to an individual who developed with ‘typical’ ADHD, the ‘usual’ treatment of psychostimulant therapy may not be as effective for them (Jin & Schachar, 2004; Nicholls, 2012). In addition, psychosocial treatments such as occupational therapy, play therapy, cognitive behavioural therapy, hold promise for these individuals, not just in terms of their cognitive functioning, but also with their family-wide adjustment to disability and rehabilitation needs (Rath et al., 2003; Cicerone et al., 2008).

In addition to the above, evidence has emerged regarding a further significant minority of individuals who develop ADHD possibly as a result of severe or on-going trauma. Neurological changes associated with childhood trauma have been well documented (Van der Kolk, 2005) and many of the resulting neurobehavioural effects of these changes (distractibility, hyperarousal) may be indistinguishable from ADHD (Szymanski, Sapanski, & Conway, 2011). Again, psychostimulant treatment for trauma-acquired ADHD may be not as effective (or appropriate) for this population. For example, psychostimulant therapy would not incorporate the use of exposure therapy or other effective methods for the treatment of trauma (Taylor et al., 2003). In addition, medical treatment of the effects of trauma may also not be ethical or appropriate in terms of ‘medicalising’ sometimes appropriate safety behaviours in relation to trauma (e.g. short term numbing or dissociation). For example, it is not known whether psychostimulant treatment may in fact increase sustained attention on trauma triggers among this group, which may result in further traumatization. This approach may undermine the general psychotherapeutic principles of acceptance and normalisation that are key facets of recovery from trauma (Briere, 1996).

In summary, any research or therapeutic involvement with individuals with attentional difficulties should ideally incorporate awareness of the social and ethical controversies surrounding ADHD. The diagnosis of children with ADHD is

increasing. Commensurate with this, is an increase in a 'biological' perspective of ADHD and often the sole use of pharmacological therapies to treat ADHD. Such dominance of a biological perspective minimizes the important role of psychosocial factors in the aetiology of ADHD and 'acquired ADHD'. This minimisation may in turn lead to a disservice to individuals with ADHD, particularly in therapeutic framework for those with histories of severe physical and emotional trauma and associated with neurological insult (a not insignificant population).

### 1.3 Developmental Outcomes Associated with ADHD

#### *Executive Dysfunction*

ADHD is associated with a range of neurobehavioural difficulties, primarily clustered around the construct of response inhibition (Nigg, 2005). An oft-cited area of neurobehavioral functioning impacted by ADHD is that of executive functioning (e.g. Barkley et al., 2001; Sergeant et al., 2002). Broadly defined as higher-order functions that serve to modulate and regulate our behaviour, cognitions and automatic responses; executive dysfunctions tend to be expressed primarily through problems with response inhibition in individuals with ADHD (Nigg, 2000). Due to a lack of demonstrated specificity, it may not be accurate to view executive dysfunction as the *primary* deficit in ADHD (Tripp & Wickens, 2009). However, significant associations between ADHD and executive functioning domains have been repeatedly found (Sergeant et al., 2002) and often posited as playing some kind of role in the formation and maintenance of ADHD-typical behaviours. Therefore, it may be helpful to view executive functioning as yet a largely theoretical intermediate step in an explanatory model of ADHD, in which neurobehavioural factors such as executive functioning domains form a cluster of factors that underlie an etiological pathway between genetic, environmental, neurochemical and neuroanatomical factors; and the behavioural phenotypes of ADHD (Tripp & Wickens, 2009). The specific domains of executive dysfunction often associated

with ADHD include deficits in working memory, vigilance, and planning (Willcutt et al., 2005) that may underwrite recognised problems with response inhibition (Nigg, 2005).

Support for the influence of executive dysfunction on the impairment associated with ADHD is persuasive. Working memory problems have been associated with difficulty with sustaining attention, learning new information and even general intellectual functioning (Engle et al., 1999). Similarly, planning deficits have been associated with disruptive and antisocial behaviours (Nigg et al., 1998); and vigilance deficits have been linked to social functioning including social skill acquisition and social problem solving (Green, 1996). Lezak et al., (2004) propose that individuals with difficulties with executive functioning deficits (such as working memory problems) may experience an inability to filter out extraneous stimuli from either the environment or from within their own minds. This emphasis on inattention and distractibility certainly fits with the clinical presentation of individuals with ADHD (Epstein et al., 2000) and the hypothesis that individuals with ADHD are primarily affected by problems with inhibitory control as a result of executive dysfunction (and motivation dysfunction, covered in the next section). Given the effects of such deficits on the self-management of behaviour, executive functioning may be seen as a necessary component of an adult's ability to function adaptively in adulthood. This statement is supported by evidence that individuals

with frontal lobe injuries tend to exhibit similar executive functioning deficits to those seen in ADHD (Kane & Engle, 2002), along with an associated drop in adaptive functioning (Williams & Mateer, 1992).

### *Motivation*

A second area of neurobehavioural functioning involving response inhibition, and in which differences are found in individuals with ADHD, is the area of motivation (Nigg, 2005). Whilst theoretically similar constructs, executive and motivational functioning are thought to originate from separate neural pathways. Specifically, Sonuga-Barke et al., (2003) have hypothesized that as a result of functional differences in the reward circuits of the amygdala and the ventral striatum; individuals with ADHD tend to have a delay of reinforcement gradient. In other words, individuals with ADHD may have greater difficulty with delaying gratification, resulting in 1) a higher preference for immediate gratification and/ or 2) a tendency towards temporal discounting. The authors further suggest that these tendencies are then mediated by social and cultural variables (such as parenting). Furthermore, Sonuga-Barke et al., (2002) have additionally suggested that these reward circuits may have a differential effect on those with ADHD resulting in two related but distinct subtypes: one in which there is a greater difficulty with behavioural disinhibition and another subtype characterised by difficulty with temporal discounting.

Research support for these reinforcement tendencies abounds; including a consistent finding that individuals with ADHD tend to show a greater preference for immediate gratification than controls (Tripp & Wickens, 2009). Immediate

gratification tendencies may theoretically underlie the above neurocognitive subtypes characterised by Sonuga-Barke et al., (2002). Both subtypes may be characterised by a greater sensitivity to reward and decreased sensitivity to punishment, which therefore leads to delay aversion in some individuals. The distinction between the two subtypes above, may be their differential response to hypothetical or 'real-life' reinforcement; whilst some individuals with ADHD may be able to accurately envision hypothetical rewards, others may respond more to immediate, tangible rewards (perhaps due to different capabilities of abstraction?). This hypothesis is supported by research by Scheres and Sumiya (2008) who found a differential response to hypothetical versus real reinforcement among individuals with ADHD on a temporal discounting task, which suggested that individuals with combined/ hyperactive ADHD symptoms may respond more to real rewards.

In developmental terms, individuals who tend towards immediate gratification may be more likely to inhibit behaviours that have an immediate, more tangible reward (such as drug use) but higher negative consequences over behaviours that may have greater reward in time or fewer harmful consequences (abstinence from drugs). Unsurprisingly, behaviours that are associated with preference for immediate gratification or behavioural disinhibition, such as gambling and drug use are also more likely to occur among individuals with ADHD (Breyer et al., 2009; Barkley et al., 2001).

The second theoretical consequence of the association between ADHD and a shortened delay gradient is a greater tendency towards temporal discounting (Sonuga-Barke et al, 2003). Temporal discounting can be defined as a tendency to disregard rewards if they are distant in time and overvalue rewards if they are more immediate (Barkley et al, 2001). For example, an individual may discount the larger long-term rewards associated with investing money, preferring instead to focus on the lesser but immediate reward of spending the money in the present. It has been suggested that individuals with ADHD may correspondingly exhibit a kind of ‘temporal blindness’ regarding the significance of negative consequences (de Wit, 2009), which may unrealistically seem as though they will occur a very long time in the future, if at all.

Preference for immediate gratification and temporal discounting are often referred to as functionally equivalent to behavioural impulsivity (Sonuga-Barke et al., 2003; Barkley et al., 2001) which is a key characteristic of ADHD. Impulsivity has in turn been repeatedly suggested as an underlying mechanism of risk-taking behaviours such as drug abuse (e.g. de Wit, 2009) and problematic drinking (e.g. Vuchinich & Simpson, 1998) and sexual risk-taking (Tapert et al., 2001).

In summary, a model of a deficit in response inhibition, comprising of executive and motivational dysfunction, may serve to at least partially explain some of the behavioural characteristics of ADHD (in particular, impulsivity, inattention and reward seeking). These behaviours may result in a higher rate of risk-taking behaviours among individuals with ADHD that in turn, may have a detrimental impact on their adaptive functioning across the lifespan. Whether a differential response to reinforcement among individuals with ADHD corresponds to variances in behaviour, is uncertain. Exploration of such neurocognitive subtypes is still in its infancy (see Castellanos & Tannock, 2002 for a review).

### *Adaptive Functioning*

Adaptive functioning can be loosely defined as:

“the extent to which an individual can handle routine daily responsibilities that are typical of an average person in the population”

(Barkley & Gordon, 2002, p.43).

A minority of researchers have suggested that ADHD can in some cases be beneficial for an individual, such as through increased creativity (Hallowell & Ratey, 1994; Weiss, 1997) or evolutionary adaptability (Shelley-Tremblay & Rosen, 1996); however, the evidence for such claims is inconsistent and several studies have not found evidence for such claims (Funk et al., 1993) or contrary evidence for increased creativity with stimulant medication (Farah, 2008). The vast majority of published research describes persistent and multi-faceted levels of impairment faced by the majority of individuals with ADHD. Although the individual financial costs associated with ADHD have not been comprehensively researched, it is estimated that the cost level to society associated with ADHD is extremely high (Pelham et al., 2007). These costs are in addition to loss of earnings and health and disability costs that may be the consequence of risk-taking behaviour associated with ADHD in adulthood. The more intangible ‘costs’ associated with individuals developing with this disorder can be persistent psychic distress as a result of repeated failure,

interpersonal conflict and frustration with one's efforts to curb one's impulses and difficulty with staying focused (Phillipsen et al., 2009). Often, this distress is expressed in a range of psychological disorders that often co-occur (Spencer et al., 2007; Hesslinger et al., 2003) and in turn, may worsen an individual's attentional problems and ability to control their impulsivity.

ADHD in childhood is associated with significant difficulties with scholastic performance and deportment, regardless of intellectual ability. For example, Barkley et al (2008) in their longitudinal research, found that individuals with ADHD are more likely to be retained a school year, more likely to receive punishment and significantly less likely to graduate from high school or university. These individuals therefore earn significantly fewer academic qualifications (Barkley et al., 2008) and in turn, may be less employable than their peers. Once employed, there is evidence of occupational impairment among individuals with ADHD. For example, adults with ADHD tend to have lower levels of occupational status (Mannuzza et al., 1993; Weiss & Hechtman, 1993); achieve lower levels of workplace productivity (de Graaf et al., 2008) and report more frequent job changes and overall job insecurity (Murphy & Barkley, 1996) and higher rates of workplace conflict with superiors (Weiss & Hechtman, 1993).

Given the above findings regarding the academic and occupational impairment associated with ADHD, it follows that individuals with ADHD tend to

earn less income per month than matched controls and experience greater financial difficulties associated with greater debt and poorer financial management, which tend to increase with age (Barkley et al., 2008).

Persistent difficulties with financial management are a primary reason for dysfunction in relationships between adults in general (Aniol et al., 1997), and this is certainly supported by findings suggesting that adults with ADHD and their spouses/ partners tend to experience greater discord as a result of difficulties with financial management, in addition to time management and parenting difficulties (Eakin et al., 2004). While clinicians have reported that relationship problems tend to be one of the most common reasons for adults with ADHD to seek treatment (Dixon, 1995), early research findings suggested that there were no significant differences in relational functioning between adults with ADHD and those without (e.g. Weiss & Hechtman, 1993). However, many earlier studies were conducted with young adults who had not typically been in a significant relationship for long, if at all (Barkley et al, 2008). More recent findings with older adults suggest that relationship functioning tends to be more impaired for adults with ADHD. For example, overall levels of satisfaction tend to be lower (Eakin et al., 2004) and extramarital affairs more frequent among adults with persistent hyperactive symptoms (Barkley et al., 2008), perhaps contributing to the increased rate of separation and divorce among adults with ADHD (Biederman et al., 1993).

These findings are unsurprising, given the association between ADHD and factors such as inattention and distractibility, which would logically place stress on interpersonal interactions. In addition, impulsive and risk-taking behaviours may not be conducive to responsible family functioning in adulthood (Sonuga-Barke et al., 2002).

The impact of ADHD symptoms on parenting ability is emerging as a further area of likely impairment in adults. For example, Harvey and colleagues found that high levels of inattention and impulsivity in parents with ADHD tends to impact negatively on parenting, via more permissive parenting, higher conflict and overreaction (2003). This finding was supported by Chronis-Tuscano and colleagues who found that maternal ADHD was related to lower levels of involvement with their child, less positive parenting and more inconsistent discipline (2008). In addition, Sonuga-Barke and colleagues found that parenting programmes for pre-schoolers with ADHD tended to be adversely affected by the mother's levels of ADHD symptomatology (2002); suggesting that parental ADHD symptoms may have a compounding effect on parenting ability. The reverse trend has also been found to occur; ADHD symptomatology in children tends to impact negatively on family life including the parent-child relationship (Coghill et al., 2008) and parent quality of life (Brown & Pacinin, 1989). This relationship between parental and child ADHD symptomatology suggest both that the parenting ability of adults with

ADHD is negatively impacted by their own attentional symptoms, and that childhood ADHD symptomatology may negatively affect the quality of life and family functioning of parents. A logical hypothesis may be that the parenting impairment associated with ADHD may be compounded by a child's ADHD symptomatology (this scenario is highly likely, given the genetic loading of ADHD and the high inheritance rate of ADHD [reviewed by Todd, 2000]). However, a surprisingly converse relationship has been found by Psychogiou et al., (2008). In their study, the researchers found that maternal ADHD symptoms ameliorated the negative effects of the child's ADHD on parenting; suggesting that a goodness-of-fit in ADHD characteristics between the maternal dyad may enable greater responsiveness to the needs of the ADHD child. This finding was consistent with Biederman et al., (2002) who found a differential effect of parental ADHD on non-ADHD children (who were negatively impacted by their parent's ADHD symptoms), versus ADHD siblings (who demonstrated a range of functional improvements associated with their parents symptoms). While this goodness of fit relationship may be due to an artefact of reporter bias (parents with ADHD may not perceive the behavioural difficulties of their children with ADHD due to their own symptoms); there has been little evidence so far to suggest that this is the case. For example, Murray and Johnston (2006) similarly found that the parenting techniques of mothers with ADHD tended to be poorer than mothers without ADHD when parenting children

with ADHD. However, the authors did not find a significant difference in the ability of mothers with ADHD to identify problematic behaviours in their children. Their solutions tended to be poorer in quality than mothers without ADHD, but they were able to identify problem behaviours in the first instance. In summary, there are mixed findings regarding the level of parenting impairment associated with ADHD. Whilst in general, parenting quality is reduced for children without ADHD, there is some evidence to suggest that the effects of parental ADHD are moderated in a relationship with children who also experience ADHD symptomatology.

The evidence regarding the relationship between ADHD and social functioning tends to be less varied. While a number of studies have demonstrated that children with ADHD tend to exhibit poorer social competence (e.g. de Boo & Prins, 2005); the evidence regarding adults is scarcer. Due to the limited research on adults, the potential reasons for possible poorer social functioning are theoretical at this stage. One possible reason for poorer social functioning is a social skill deficit in adults with ADHD. Indeed, Weiss and Hechtman (1993) concluded from their research that adults with ADHD had overall poorer social skills in a range of domains, including heterosocial interactions. Similarly, Friedman and colleagues (2003) have demonstrated that adults with ADHD have lower rates of social competence, based on emotion- processing and expression abilities.

A further possible reason for poorer social functioning relates to problems with emotional and behavioural dysregulation. If an individual is unable to regulate their emotions or behaviour within a social context, the quality of social exchanges is likely to be compromised. Indeed, a number of studies have found an association between ADHD and social anxiety (Biederman et al., 2006; Torgersen et al., 2006; Sobanski, 2006). Social anxiety in turn has a bidirectional relationship with poorer social functioning (often as a result of the outward signs of the individual's anxiety and safety behaviours; Clark & Wells, 1995). See Schatz and Rostain (2006) for a more in-depth review of possible pathways between ADHD and comorbid anxiety.

Difficulty with *behavioural* dysregulation may also impact an individual's social competence. For example, as the level of organisation and prioritisation required in maintaining interpersonal relationships may be problematic for individuals with ADHD, it follows that behavioural dysregulation may relate to a greater difficulty with the overall maintenance of friendships.

Similarly, during discrete social events, individuals with ADHD may experience impairment in their social interaction due to greater difficulty with maintaining attention and higher levels of distractibility. This idea is supported by the findings of Weiss and Hechtman (1993) who found that the social skills deficits in individuals with ADHD was associated more with behavioural dysregulation,

rather than cognitive social deficits. In other words, the young people in their study knew by and large, what was expected of them in a social setting and knew when they were not meeting these expectations but they felt unable to control their behaviour within the social setting. This finding is consistent with research with children with ADHD, in which restless and intrusive behaviours have been found to predict social dysfunction (Erhardt & Hinshaw, 1994).

The consequence of such behaviours may involve higher levels of peer rejection, which in turn may result in higher levels of social anxiety; resulting in a cycle of behavioural disinhibition, poorer social functioning, increased social anxiety and then poorer social functioning. Indeed, Murphy et al., (2004), have found lower levels of self-regulatory behaviours in adolescents (similar to the executive functioning deficits common to ADHD) to be negatively associated with social functioning and Huang-Pollock et al., (2009) found that executive dysfunction predicted poor social outcomes in children with inattentive subtype of ADHD.

In summary, although the evidence is far from exhaustive, there seems to be an association between ADHD in adulthood and compromised social functioning. Due to the dearth of research in this area, the possible mediators between ADHD and social functioning in adults such as social anxiety and/ or regulatory deficits have yet to be fully explored. What is more certain however, is

the detrimental effect of poor social competence on an individual's sense of self-worth/ self-concept in adults generally (Parker & Asher, 1987) and more specifically in adults with ADHD (Weiss & Hechtman; 1993).

### *Psychological Adjustment*

Children, young people, and adults with ADHD tend to have poorer psychological outcomes than individuals without ADHD (e.g. Murphy & Barkley, 1996; Torgersen et al., 2006; Klein & Mannuzza, 2010). More specifically, follow-up studies with adults with ADHD demonstrate a higher rate of a number of adverse psychological and existential outcomes. For example, Biederman and colleagues followed up a sample of young adults diagnosed with ADHD in childhood and found that a greater proportion of these individuals experienced life-time and current mood, anxiety substance and antisocial psychiatric disorders, compared with controls (2006). These findings are commensurate with a number of other studies. For example, in a review of extant literature, Sobanski (2006) found that ADHD in adulthood was associated with higher life-time rates of major depressive, anxiety and substance disorders, along with higher rates of antisocial personality disorder and ADHD- intrinsic sleep disturbance. Similarly, longitudinal follow-up in the large-scale Milwaukee and UMASS studies (University of Massachusetts Medical School), demonstrated that individuals with ADHD experience higher rates of comorbid disorders, including: mood disorders, substance abuse disorders, externalizing disorders (oppositional defiant disorder and conduct disorder) and suicidality. In addition, adults with ADHD were more likely to experience multiple comorbidities, with roughly one third meeting criteria for at least three other

psychiatric disorders (Barkley, Murphy & Fischer, 2008). The additive effects of multiple comorbidities are well known in the field of general psychiatric literature (Kessler et al., 2005). In the population of adults with ADHD, the effects of multiple comorbidities may well be even more impairing due to the pervasive and persistent effects of ADHD itself (Kessler et al., 2006).

Unsurprisingly, in existential terms, individuals with ADHD tend to see themselves as less worthwhile than controls. They are likely to view themselves as less honest, more disorderly, more nervous, and overall, less happy than controls (Weiss & Hechtman, 1993). Longitudinal research with twins with ADHD demonstrated a persistent association between ADHD and low self-esteem in children, aside from a small minority who actually scored highly on self-esteem measures. This minority group of children with ADHD tended to have longer histories of ADHD, suggesting perhaps that earlier intervention may lead to higher levels of adaptation (Edbom et al., 2008). The level of life satisfaction tends to be lower for adults with ADHD on factors such as life productivity, psychological health and relationship functioning and life outlook (Brod et al., 2006). In addition, adults with ADHD tend to view the future more pessimistically than adults without ADHD (Ramsay & Rostain, 2005).

In summary, individuals with ADHD are at a higher risk of a range of adverse outcomes, which tend to culminate in adulthood. Despite the optimistic claims by some writers, that ADHD can be beneficial; there is convincing evidence that for the majority of individuals, the effects of ADHD are pervasive and persistent. The attentional problems associated with ADHD may stem from a dual pathway model of response disinhibition (from executive and motivational dysfunction). In turn, these attentional problems are associated in adulthood with a range of outcomes that signify poorer adaptive functioning (the ability to manage routine responsibilities). Adults with ADHD tend to have poorer scholastic records, lower levels of formal academic achievement and poorer occupational functioning. On average, they have lower income and are less able to manage their finances. The friendships and significant relationships of adults with ADHD tend to be less successful, with a higher rate of separation and divorce. The quality of parenting by adults with ADHD tends to be poorer (although this may be mediated somewhat, if the children also have ADHD). Finally, psychological functioning appears to be compromised for a significant number of adults with ADHD, with higher rates of comorbid psychiatric and substance abuse disorders across the lifespan. Unsurprisingly, the level of psychological and existential distress tends to be significantly higher for adults with ADHD, as demonstrated by lower levels of self-esteem and higher life dissatisfaction and hopelessness. To complete this review of

the high needs of this psychiatric population, the following section refers to the greater risk of *mortality* associated with ADHD in adulthood, due to the high levels of risk taking associated with this condition.

### *Risk Taking*

It is generally accepted that ADHD is associated with poor impulse control and comorbid psychopathology (Hesslinger et al., 2003), often continuing into adulthood (Biederman et al., 2006). There is a growing body of evidence suggesting that in *childhood* and *adolescence*, individuals with ADHD are at an increased risk of accidental injuries, such as burn injuries (Mangus et al., 2004) serious injuries including traumatic brain injuries (Merrill et al, 2009) and are more likely to engage in risk-taking behaviours such as dangerous alcohol and drug use (Biederman et al., 1998).

Similarly, research to-date suggests that those *adults* who continue to be significantly affected by ADHD symptomatology are more likely to engage in a number of high-risk behaviours such as dangerous driving (Murphy & Barkley, 1996; Woodward, Fergusson & Horwood, 2000), substance abuse (Biederman et al., 2006), accidental injury (Kaya, et al., 2008) and sexual risk taking behaviour (along with increased rates of teenage pregnancy and sexually-transmitted infections (Woodward & Fergusson, 1999; Barkley, 2002).

Very little research has assessed the extent to which adults with ADHD take self-protective measures against injury in their day-to-day lives; particularly in relation to the behaviours mentioned above (e.g., dangerous driving, and accidental

injury). For example, if adults are less attentive in general and are likely to pay less attention to detail, it is logical that they may be less likely to wear a seatbelt in a car, safety helmet when riding a bicycle or motorbike, and fail to pay attention to their street safety (e.g., being out alone at night or crossing a street without looking for cars). Indeed, Clancy, Rucklidge and Owens (2006) found that adolescents with ADHD were likely to engage in more dangerous road crossing during a virtual reality experiment. Similarly, Barkley et al., (Barkley, 2008) found that adults with ADHD were likely to engage in a raft of dangerous driving behaviours and Jonah et al., found an association between high sensation-seeking in adolescents and reduced safety belt use (Jonah et al., 2001). However, very little mention is made in the literature of an association between *adult* ADHD and use of car restraints. In addition, in a literature review, no studies were found that have specifically assessed the use of safety helmet use in children or adults with ADHD.

Based on the literature, it is certainly plausible that any association between childhood ADHD and these risk variables may continue into adulthood alongside persistent ADHD symptomatology. Exploring these safety issues in adults with ADHD may well be an effective tool in reducing the risk of disability and mortality in this population. If this population is found to be at greater risk of accidental or deliberate harm, safety intervention strategies can be included in psychological treatments for ADHD.

Another behaviour that involves intrinsic risk is interpersonal violence. Given the association between impulsivity and hostile violent interactions (Ramirez & Andreu, 2006), it is surprising how little research has explored a possible relationship between adult ADHD and perpetration or victimisation of violence (independent of comorbid conduct disorder). In children and adolescents, ADHD has been found to be associated with both assaultive and suicidal behaviour (Goodman et al., 2008); and to moderate the relationship between conduct problems and reactive aggression (Waschbusch & Willoughby, 2008). In *adulthood*, Retz and Rossler (2010) found ADHD to be associated with reactive violent behaviour (as opposed to proactive) among prison inmates. However, apart from a study by Dowson and Blackwell (2009); which found ADHD to be associated with impulsive aggression in adult males; and a higher rate of self-reported physical assaults by adults followed up in the UMASS and Milwaukee studies (Barkley et al., 2008), to date there is a dearth of research relating ADHD in a non-offending or non-clinical population with violent or aggressive behaviour. In addition, the mediators of such behaviour are generally not well understood, nor are the types or contexts of aggressive behaviours well-explored. For example, Stuart and Holtzworth-Munroe (2005) found a relationship between domestic (husband) violence and impulsivity in the general adult population, which suggests that this is an additional area in need of

exploration among adults with ADHD, given the relationship between ADHD and impulsivity.

Additionally, little research has been conducted into the extent to which adults with ADHD have been the *victims* of violent behaviour. Given the interpersonal problems associated with ADHD, as well as the levels of impulsivity inherent in this condition, adults with ADHD may find themselves in more conflict situations, or may behave in ways that reduce their levels of personal safety. These risks are inherent in behaviours that are known to be higher in adults with ADHD, such as increased drug and alcohol intoxication (Biederman et al., 2006) and higher occurrences of road rage (Barkley, 2008).

In a review of the literature, studies of children with ADHD report a higher rate of bullying victimisation (Unnever & Cornell, 2003) and physical and sexual abuse (Ford et al., 2000; Briscoe-Smith & Hinshaw, 2006). In adults, the evidence points to similarly elevated levels of past victimisation. For example, Rucklidge and colleagues (2006) reviewed the retrospective self-reports of adults diagnosed with ADHD and found a significantly higher rate of child physical and sexual abuse than adults without ADHD. Similarly, respondents in the Milwaukee study reported that they had experienced higher rates of childhood physical and sexual abuse compared with controls (Barkley et al., 2008) and war veterans with ADHD reported higher levels of PTSD following combat than veterans without

ADHD (Adler et al., 2004). Given the developmental overlap between child abuse victimization and the onset of ADHD; and the phenomenological overlap between ADHD and PTSD symptoms (Weinstein et al., 2000) there is a possibility that trauma experience may play a role in the aetiology of ADHD for a subset of individuals. This hypothesis is supported by longitudinal findings suggesting the potentially instrumental role of trauma in the later development of psychopathology (Fergusson et al., 1996). However, without further, carefully structured longitudinal research into the development of ADHD, it is difficult to surmise the direction of the relationship between ADHD and childhood trauma. Furthermore, regardless of the direction of association between trauma and ADHD, few studies have assessed the *rate* of violence victimisation in adults with ADHD. In a literature review, there were no studies for example, which referred specifically to either domestic (intimate partner) violence or stranger violence victimisation in adults with ADHD. Given the potentially confounding effects of trauma on ADHD symptomatology, it is of high clinical relevance to explore any potential association between ADHD and victimisation; in addition to any confounding effects of ADHD with trauma in the psychosocial functioning of adults.

A further area of ADHD comorbidity that has only limited research thus-far is in relation to health-risk behaviours, i.e. the extent to which adults with ADHD engage in behaviours that relate directly to the risk of major causes of death

in industrialised nations: cardio- and cerebrovascular diseases, cancer, accidents, lung and liver diseases, diabetes and infectious diseases (Stroebe, 2000). Barkley and colleagues (2008) addressed some of these behaviours in the UMASS and Milwaukee longitudinal studies, and found a significant association between adult ADHD and sleep problems, compromised medical and dental self-care, and some indications of an increased heart disease risk (Barkley et al., 2008). However, many other health issues such as poor nutrition, pain disorders and poor health knowledge (e.g. risks of high cholesterol, importance of folic acid in pregnancy) have not yet been fully addressed. Furthermore, few studies have explored the relationship between the decision-making processes of adults with ADHD and health-risk behaviours. For example, addiction and other health-risk behaviour research often refer to the contributing factor of temporal discounting (e.g. Vuchinich & Simpson, 1998) and preference for immediate gratification. As mentioned earlier, these cognitive mechanisms are often referred to as functionally equivalent to behavioural impulsivity (Sonuga-Barke et al., 2003; Barkley et al., 2000), a key characteristic of ADHD that has been repeatedly suggested as an underlying mechanism of risk-taking behaviours such as drug abuse and problematic drinking (e.g. Vuchinich & Simpson, 1998; de Wit, 2009). Several studies have indeed found evidence of an association between impulsivity (and the components of) and health-risk taking. For example, Miles et al., (2001) found that the personality trait of sensation seeking

increased the likelihood of marijuana use and that the additive effect of a sensation seeking personality and marijuana use greatly increased the risk of engaging in promiscuous levels of sexual intercourse. Secondly, Stanford et al., (1996) found that the trait of impulsiveness was linked with a higher rate of risk-taking behaviours such as fighting and drug use. Thirdly, Kahn et al., (2002) similarly found an association between impulsivity and sexual risk-taking in young women. As with other types of risk-taking behaviour, exploring and understanding the mediators of the association between health-risk behaviours and ADHD would be a necessary part of developing targeted interventions to improve the health and safety of this population. It is certainly an area of ADHD research that has received little research attention to-date.

A third emerging area of adult ADHD research is an association between ADHD and self-destructive behaviours. Although the scope of research is so far rather limited, there is emerging evidence of a significant association between ADHD and high-risk suicidal behaviours (Chronis-Tuscano, 2010; James, 2004). Potential mechanisms for a relationship between ADHD and self-directed harmful behaviours follow a logical progression. Impulsivity is a key characteristic of ADHD and research has demonstrated that impulsivity is also associated with self-harm (Evans et al., 1996) and suicidal behaviours (Horesh et al., 1999; Brodsky et al., 2001). In addition, ADHD in adulthood is associated with a number of comorbid

disorders, such as depression, anxiety and substance abuse (Hesslinger et al., 2003). Comorbid psychiatric disorders such as these are in turn; recognised risk factors for suicidal behaviours (for example, Beautrais et al., 1996). Importantly, self-injurious and suicidal behaviours are factors that are related to an increased risk of mortality (DVDRC, 2008).

Unlike risks associated with other psychiatric disorders, there has been scant research demonstrating a relationship between ADHD and self-directed harmful behaviours in adults. In a review of recent literature, limited research was found that related ADHD in young people and self-harm behaviours. For example, Izutsu et al (2006) found higher rates of childhood hyperactivity amongst those that reported self-harm behaviours in an adolescent population; and Galera et al., (2008) found that childhood combined type-ADHD predicted suicidality in adolescent boys. Chronis-Tuscano et al., (2010) found higher rates of suicide attempts amongst adolescent males and females who had been diagnosed with ADHD in childhood. The authors also found this relationship to be mediated by both comorbidity and subtype (hyperactive subtypes had a higher association with suicide).

In adults, the evidence thus far has consisted of nonspecific indicators of an association between ADHD and suicide. For example, James et al., (2004) reviewed the psychopathology profiles of suicide completers and found a significant association between those that completed suicide and a diagnosis of ADHD. The

rate of suicide completion by those with diagnosed ADHD was found to be approximately three times higher than the US national suicide rate for males in the same age group. The researchers suggest that other findings of this kind have not been found as a number of factors may obscure the risk of suicide associated with ADHD. For example, the researchers point out that although ADHD is often diagnosed in childhood or adolescence, many of the follow-up studies may not include the age group in which individuals are most at risk of self-harm or suicide (James et al., 2004). Somewhat in contrast to this finding, Phillipsen et al., (2009) did not find a significant association between ADHD and actual self-harm behaviours in a comparison of ADHD and Borderline Personality Disorder symptoms in adults; but their adult ADHD patients scored highly in a measure of self-destructive tendencies, including suicidal ideation and thoughts of hurting themselves. However, the researchers had excluded individuals with ADHD with a comorbid current mood or substance abuse disorder, thereby precluding them from exploring these variables as potential mediators between ADHD and actual self-harm behaviours. The same authors did note that an enhanced risk for self-harm was found in male and female adolescents with ADHD by Izutsu et al., (2006); and they postulated that self-destructive tendencies may be attributed to the psychological hardship associated with the developmental course of ADHD: “one explanation for these high self-destruction scores may be the long-standing experience of

underachievement and low self-respect in the chronic course of adult ADHD leading to self-hate and even suicidal ideations” (Phillipsen et al., 2009).

In summary, significant research gaps exist regarding the extent to which individuals with ADHD are putting themselves at major risk of illness or injury or death in *adulthood*. In addition, given that this is a research area in its infancy, there is limited research to-date which explores possible explanatory models of adult ADHD and risk-taking behaviours. For example, although there are indicators of an association between ADHD and suicide risk, an operational model of this association would help to inform clinical practice, therefore increasing the effectiveness of therapeutic interventions. The same necessity applies to the relationship between ADHD and high-risk behaviours in general. If more research is undertaken involving potential mediators between ADHD and behaviours with negative outcomes such as dangerous drug use or inadequate diet; explanatory models can be developed. These models can in turn be tested and provide guidance for, intervention strategies for adult ADHD.

The topics discussed above that pertain to ADHD in adults all contain significant research gaps (suicidal and self-destructive behaviours; threats to personal safety; and health-risk behaviours). As such, these topics form the key components of the research addressed in this thesis. This thesis will directly address the following questions in the following chapters: 1) whether adults with ADHD are

at a higher risk of self-harm and suicidal behaviours and how this relationship might be mediated by psychosocial factors; 2) whether motivational differences in adult ADHD might help to explain risk-laden decision making that may compromise personal safety; 3) whether comorbid ADHD and child abuse victimisation may increase the risk of negative outcomes and 4) whether adults with ADHD are at a greater risk of ill-health or disability due to increased health-risk behaviours. The following section provides an explanatory model for the above topics by illustrating an integrated biopsychosocial model of ADHD and risk taking.

#### 1.4 Theoretical Models of ADHD and Risk Taking

In attempting to formulate how ADHD symptomatology may be associated with risk-taking behaviour, the underpinnings of both ADHD and risk-taking behaviour will be addressed in order to assess theoretical compatibility. Within this theoretical framework, key cognitive and behavioural characteristics of ADHD will also be discussed.

Many of the risk-taking behaviours investigated in this thesis relate to an individual's health status, either directly (such as substance use or diet) or indirectly (such as the consequences associated with self-harm or personal safety). In addition, models of health behaviour have been used repeatedly as explanatory models of risk-taking behaviour (e.g., Hingson et al., 1990; Jackson et al., 2000; Albarracin et al., 2001). For example, the health beliefs model (Becker & Maiman, 1975) detailed the importance of risk/ benefit analysis in an individual's decision-making regarding their health behaviour. This model was extended further in Ajzen and Fishbeins' theory of reasoned action (1980) and the theory of planned behaviour (Ajzen, 1991) which detailed firstly the importance of motivation (intention) to change their behaviour and secondly, the importance of an individual's belief in their ability to control their behaviour. When assessing such models of health behaviour for goodness of fit with ADHD-typical behaviours, there is an immediate problem with compatibility. For example, the theory of reasoned action and planned behaviour, by

their very nature, are dependent on rationality and adequate executive functioning (planning). As the authors suggest: “the theory is based on the assumption that human beings are usually quite rational and make systematic use of the information available to them...we argue that people consider the implications of their actions before they decide to engage or not engage in a given behaviour” (p. 5, Ajzen & Fishbein, 1980). This assumption may not be very compatible with what we know about the behavioural characteristics of ADHD (impulsivity, difficulty with planning and delaying gratification). Furthermore, the theory of reasoned action and planned behaviour rely on an individual’s intention to change their behaviour. However, although an individual with ADHD may be motivated to stop drinking alcohol (has the intention to stop) it is reasonable to presume based on the research that an individual’s level of motivation in ADHD may not be as powerful a predictor of successful action, as it may be in an individual without ADHD (motivation is not enough). Therefore, integrated theories of behaviour may be more appropriate for explaining risk-taking behaviour in ADHD, such as the Unified Theory of Behaviour Change as suggested by Chacko et al., (2010). Although incorporating important components such as behavioural intention from the theory of reasoned action (Ajzen & Fishbein, 2005), the authors also include variables associated with ADHD that may potentially confound an individual’s best intentions and beliefs. For example, the authors note the importance of including immediate determinants of

behaviour, such as skills/ knowledge (such as delaying gratification and behavioural organisation) and salience (maintaining attention/ avoiding distractibility) (Chacko et al., 2010).

Such an integrated model of health behaviour may translate as an adequate macro-level explanatory model for the risk-taking behaviour of adults with ADHD (comprising both secondary and immediate variables that may influence behaviour). However, the model does not detail the more distal mechanisms that may underlie such behaviours in adults with ADHD and how these mechanisms may differ from the behaviours of the general population (if they do). For example, the unified theory of behaviour change does not emphasize the neurobehavioural mechanisms that appear to operate differently in ADHD. Given the potentially important role of functional differences in neural rewards circuits and a related decreased tolerance for delayed gratification (e.g., Sonuga-Barke, 2003) it seems pertinent to include such variables in a comprehensive model of ADHD behaviour. A model is detailed below which provides an understanding of how the distal mechanisms of ADHD (e.g., biological, developmental) as well as the proximal cognitive /behavioural and psychosocial variables (as informed by ADHD research) may alter these health-related behaviours.

*An Integrated Biopsychosocial Model of ADHD and Risk Taking*

A theoretical underpinning common to both models of health behaviour and psychological dysfunction is a biopsychosocial perspective. In terms of health behaviour, such a theory suggests that biological factors (such as genetic predisposition, prenatal development), individual or psychological factors (such as personality) and social factors (such as peer-group or media influences) all play a role to a greater or lesser degree, in influencing an individual's health behaviour. These factors cannot be viewed in isolation as responsible for influencing health behaviour as they are heavily interrelated (Baum & Revenson, 2001). Similarly, a biopsychosocial perspective of psychological disorders can be very informative and are structured in a similar way. ADHD can be usefully conceptualised as a disorder comprising of interrelated biological factors (such as a genetically linked family history or prenatal chemical exposure), psychological factors (such as executive functioning deficits or presence of comorbid disorders), and social factors (such as a permissive parenting style or parental depression).

Research has largely supported a biopsychosocial conceptualisation of health-behaviour (Baum & Revenson, 2001), and the processes that explain health-behaviour in general, may also explain an individual's health-risk behaviour. Baum and Posluszny (1999) have provided an integral model involving three pathways in which psychosocial and/or behavioural factors may influence and be influenced by,

health and illness. These pathways include: 1) biological influences on emotion and/or behaviour which directly affect and are affected by, health, illness & mortality; 2) behaviours that involve an inherent risk to health or morbidity; and 3) behaviours that are indirectly associated with illness or the risk of morbidity. The adapted pathways of Baum and Posluszny (1999) and the incorporation of neurobehavioural mechanisms of ADHD assist in describing pathways by which ADHD may contribute to an increased occurrence of risk-taking behaviours (see Figure 1 below). This health behaviour model has been expanded and modified to illustrate the theoretical justification for investigating the health- and associated risk-taking behaviours of adults with ADHD. For example, within each of the three pathways described by Baum and Posluszny (1999), the authors suggest that individual *behaviour* can affect health and illness. These behaviours (that both directly and indirectly influence health and survival) are mediated by neurobehavioural mechanisms. When these neurobehavioural mechanisms operate maladaptively, as is suggested in research relating to ADHD, it is probable that the risk of ill health or morbidity should increase. For example, it is logical to suggest that an individual's decision to engage in health-risk behaviours such as drug use or participating in unprotected sex may be influenced by their self-regulation and problem-solving capabilities (Raffaelli & Crockett, 2003), both capacities that are compromised in ADHD (Barkley & Murphy, 2010).

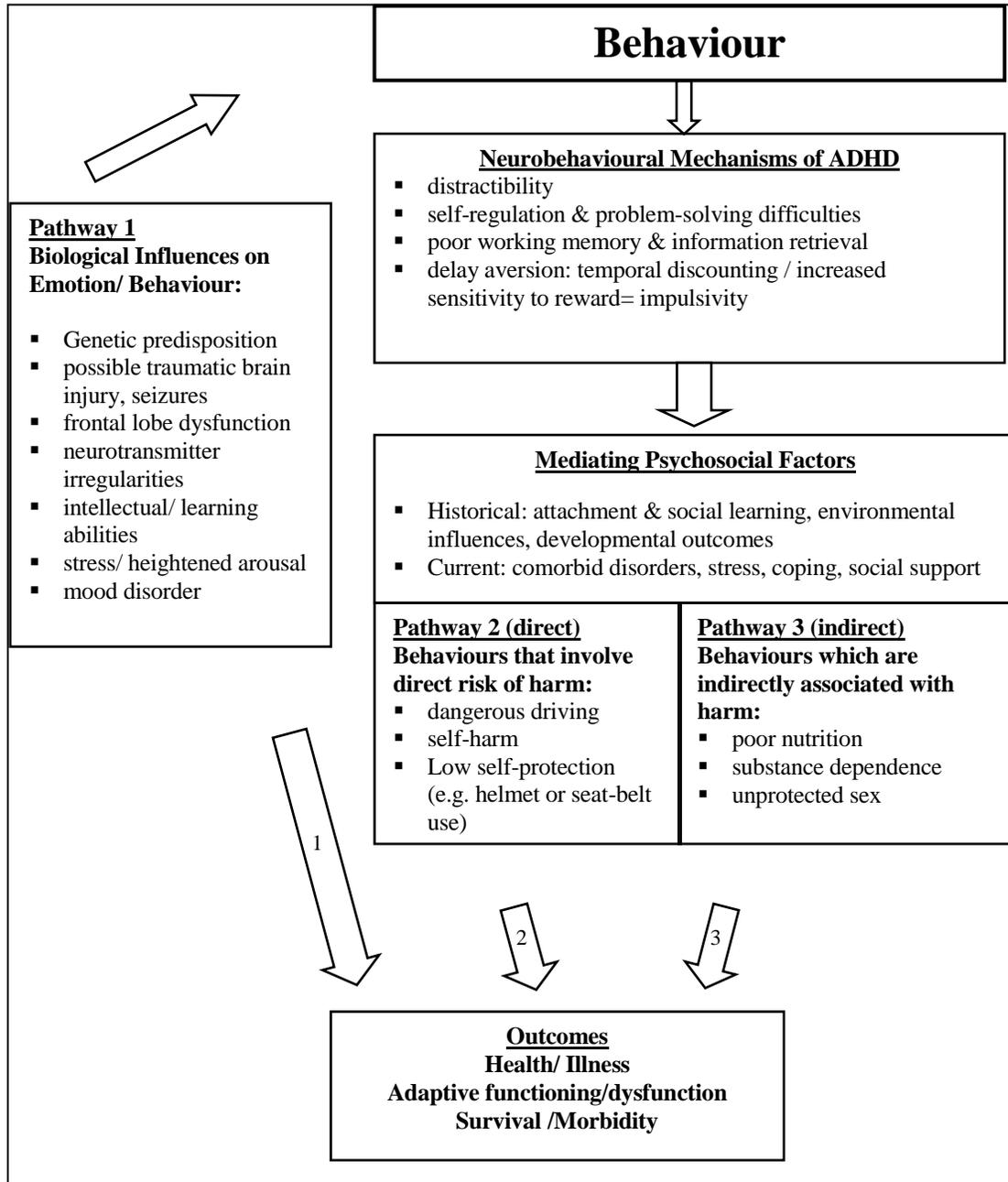


Figure 1: Biopsychosocial model of Risk-Taking behaviour of adults with ADHD

(Adapted from Baum and Posluszny (1999)).

In addition, it is likely that risk-taking behaviours may be mediated by psychosocial variables such as early attachment experiences (e.g. poor attachment, trauma), current psychological status (e.g., presence of comorbid disorders, current stress levels). This two-tiered moderation/mediation model (neurobehavioural + psychosocial variables) helps to explain some of the potentially higher rates of risk-taking behaviours in adults with ADHD. This is achieved by incorporating both ‘endogenous’ and ‘exogenous’ variables that can be both historical and current influences on behaviour. As such, this model is compatible with much of the current literature and opinion on adult ADHD, as previously reviewed in this chapter. In addition, this model provides the theoretical backdrop for the research detailed within this thesis.

*Rationale and Hypotheses for Empirical Research*

As mentioned earlier, this thesis will detail research in which adult ADHD may influence risk in four main areas (self-destructive behaviours, behavioural risk-taking, comorbid victimisation, and health-risk behaviours). Each of these risk areas will be assessed within the framework of possible mediators or moderators that are based on current literature. In Phase I it is hypothesised that ADHD symptomatology is related to self-harm and suicidal behaviour, both directly and indirectly via psychosocial variables. ADHD symptomatology has a direct effect on self-harm and suicidal ideation and suicidal attempts and also acts indirectly via psychosocial outcomes including comorbid psychopathology (mental health) and coping behaviours. In Phase II it is hypothesized that ADHD symptomatology is related to rates of risk-taking behaviours both directly and indirectly via motivational variances. ADHD symptomatology has a direct effect on risk taking in areas such as: personal safety; social violence; sexual risk taking; and substance use. It is also hypothesized that ADHD symptomatology acts indirectly via motivational variances including: sensitivity to reward and punishment, and temporal discounting. In Phase III it is hypothesized that comorbid abuse victimisation in childhood moderates the effect of ADHD symptomatology on negative psychological outcomes in Adults. ADHD symptomatology has a direct effect on psychological outcomes such as increased rates of mood, anxiety and substance

abuse disorders. It is also hypothesized that ADHD symptomatology can act indirectly on these outcomes via experience of childhood abuse (particularly physical or emotional abuse), i.e., comorbid child abuse victimization increases the risk of latter negative psychological outcome in adulthood. Finally in Phase IV, it is hypothesized that ADHD symptomatology is related to negative health outcomes, both directly and indirectly via psychosocial variables. ADHD symptomatology has a direct effect on negative health outcomes such as poor diet and nutrition, eating pathology, poor dental health and lower activity levels, and also acts indirectly via psychosocial outcomes including comorbid psychopathology (mental health), and social support and stress levels.

The importance of considering such mediators and moderators is to provide theoretical information to guide effective interventions into harmful risk-taking behaviour. For example, if a clinician is to effectively help with reducing problematic substance abuse in this population, it would be necessary to understand whether ADHD is associated with differential motivational influences that mediate drug or alcohol use (such as decreased sensitivity to punishment). Such a finding would suggest that treatments involving punitive measures will be less successful in ADHD treatment.

Therefore, the overall purpose of this investigation into the risk-taking behaviours of adults with ADHD is pragmatically guided and twofold: an understanding of the self-regulation processes of adults with ADHD in relation to risky behaviour may assist in informing clinical intervention strategies with this population. Secondly, given the global costs associated with ADHD across the lifespan, a greater understanding of the cognitive-behavioural and psychosocial factors influencing health, disability and mortality risks may help to inform prevention and early intervention strategies among all populations.

## METHODS

### 2.1 Participants

The research methods used in this study were approved by both the university and regional Health and Disability ethics boards. Consent forms were collected prior to interview, and reviewed to ensure that participants were fully informed. Participants were recruited via a participant pool from existing studies at the University of Canterbury; advertisements at the University of Canterbury; local media; and referral from community mental health treatment services. Thirty-five adults were recruited into the ADHD group (23[66%] males, 12[33%] females) by meeting the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders (4<sup>th</sup> Edition; American Psychiatric Association, 2000) criteria for Attention-Deficit/ Hyperactivity Disorder. These participants were assessed using the Conner's Adult ADHD Diagnostic Interview for DSM-IV (CAADID; Epstein, Johnson, & Conners, 2000); a semi-structured interview that assesses both current and retrospective symptoms of ADHD within the context of an adjunctive developmental history interview. Inclusion criteria for the clinical group also consisted of at least one elevated T-score of 70 or above on the DSM-IV ADHD Symptoms Total Index on the Conner's Adult ADHD Rating Scale on *either* the self-report or observer form (CAARS; Conners, Erhardt, & Sparrow, 1999).

Corroborated evidence of the onset of symptoms in childhood, and persistence into adulthood were also necessary for a current diagnosis. This was established by methods such as: the review of school reports; partner or parent interview; and the completion of the CAARS Observer form by a family member, close friend or partner. A comparison group of thirty-one adults (20[65%] males, 11[35%] females) were recruited in the same way as the ADHD group. The control group was comparable to the clinical group for age, gender, socio-economic status and education. These participants did not reach DSM-IV criteria for ADHD, had a T-score 60 or less on the CAARS DSM-IV ADHD Symptoms Total Index and did not have a history of significant attentional problems.

All participants were administered the Structured Clinical Interview for DSM-IV-TR Axis 1 Disorders, Research Version (SCID-I; First et al., 2002), to screen for the presence of significant comorbid psychological disorders. Comorbid disorders were only diagnosed when both the full criteria were met *and* significant impairment was evident. As an adjunct to the SCID-I, participants were comprehensively screened for safety issues which may have impacted on their ability to participate, such as significant and current use of substances or significant and current risk of self-harm or suicide. No participants were excluded because of safety issues although three were referred for on-going intervention and monitoring from psychiatric emergency services. The Wechsler Abbreviated Scales of

Intelligence (WASI; Wechsler, 1999) was administered to both groups to estimate participants' general level of intellectual functioning, in addition to highlighting any fundamental learning or cognitive deficits.

Exclusion criteria for both groups in this study were (a) IQ under 70; (b) a history of significant psychotic illness; (c) a history of significant traumatic brain injury; (d) diagnoses of pervasive developmental disorder; or (e) being unable to provide corroborating information for the assessment (e.g. parent or partner completed measures and/ or recent clinical diagnosis of ADHD by a trained mental health professional).

*Retention and Adherence*

In addition to the 66 final participants who completed the study, a further 43 were assessed for eligibility for the study. Of these, 21 commenced participation by returning paperwork or responding to phone calls; 23 did not commence participation, either because they did not meet initial screening criteria (e.g. outside age range, current drug use or criminal offending behaviour) or due to lack of interest or motivation to participate. Of the 87 that commenced the study, 14 (10 from ADHD group) dropped out before completion and 7 were excluded from the study following commencement of the study (5 from ADHD group). Of those that dropped out of the study, 10 consented to participate but withdrew before the study commenced (7 from ADHD group) citing reasons such as: “not enough spare time” or “no longer interested/ motivated”, or because of relocation/moving. Once the study commenced, 5 (4 from ADHD group) participants were not retained as they did not attend scheduled appointments on several occasions and did not respond to follow-up phone calls or emails. Of these, 2 gave no reason as to their decision to decline to participate; 2 withdrew from the study due to cited lack of interest or motivation; and 1 relocated to another city. An additional 7 participants commenced the study but were excluded due to exclusion criteria. Of those, 4 were excluded due to not currently meeting full criteria for ADHD (sub-clinical levels of impairment) despite a history of childhood impairment; and were ineligible for the

control group as their CAARS scores were above a T-score 60 on the CAARS DSM-IV ADHD Symptoms Total Index. A further single participant was excluded because they were unable to provide any corroborating evidence of ADHD in childhood (e.g., school reports, parent or sibling interview, reports from health professionals, etc.), therefore the validity of a current diagnosis of ADHD could not be supported. A further single participant was excluded from the ADHD group as they met criteria for a Pervasive Developmental Disorder. In addition, 2 participants were excluded from the control group because they were assessed as having subclinical levels of ADHD symptoms and histories of attentional problems.

## 2.2 Measures

The measures used in this study assessed: 1) demographic information, 2) intellectual functioning, 3) ADHD symptomatology and severity, 4) psychiatric comorbidity, 5) self-destructive behaviours, 6) risk-taking behaviours, 7) psychosocial functioning, including style and level of coping and social support, 8) history of child abuse, and 9) reward sensitivity and temporal discounting, assessed through computer experiments. In total, there were 18 measures. Instructions to the measures were either written at the top of the self-report measures or delivered verbally before structured interviews. These measures are presented in Appendix A.

*Demographic Information.* All participants were administered a questionnaire that pertained to demographic variables including: age, gender, ethnicity, educational achievement, household income level and occupation.

*Socioeconomic Status (SES).* The occupational responses from all participants were converted into SES scores using the New Zealand Socio-Economic Index (NZSEI; Davis, McLeod, Ransom, & Ongley, 1997); a measure which involves the assignment of a score based on one of 97 coded occupational groups, which range from 10 to 90 (10 being the lowest and 90 representing the highest occupational group).

*Intellectual Functioning.* The Wechsler Abbreviated Scales of Intelligence (WASI; Wechsler, 1999) were administered to all participants in order to estimate general levels of intellectual functioning, in addition to highlighting any fundamental learning or cognitive deficits. The WASI includes the administration of the Vocabulary, Similarities, Matrix Reasoning and Block Design subtests of the WAIS-III and takes approximately 30 minutes to administer. The WASI has been found to have good levels of reliability and validity, correlating highly with full scale IQ scores on the comprehensive Wechsler scales (Sparrow & Davis, 2000). Although there is some evidence of over-estimation of IQ by administration of the WASI (Axelrod, 2002), this would be equally likely to affect both the ADHD and control groups in this study. Therefore, the consistency of intellectual functioning between the groups is unlikely to have been affected.

*ADHD Symptomatology.* All participants were administered a range of structured interviews in order to assess ADHD symptomatology and inclusion/exclusion criteria. These included the *Conners Adult ADHD Rating Scale (CAARS)*. All participants were administered the CAARS (Conners, Erhardt, & Sparrow, 1999) to screen for the presence of attentional difficulties, which may have been suggestive of ADHD. In addition, the CAARS provided a measure of severity of symptoms for those participants who did reach criteria for ADHD. The CAARS contains both a self-report and an observer-report questionnaire, each taking

approximately 15 minutes to complete. The psychometric properties of the CAARS questionnaires have been found to be excellent. For example, internal consistency alpha coefficients range from .86 to .92, test-retest reliability coefficients range between .87 and .95 (Erhardt, Epstein, Conners, Parker, & Sitarenios, 1999). In addition to the above psychometric, the *Conners Adult ADHD Diagnostic Interview for DSM-IV (CAADID)* was administered to both groups. The CAADID (Epstein, Johnson, & Conners, 2000) is divided into two parts, the first of which can be administered as a self-report questionnaire. Part I covers a participant's developmental, medical, psychological, schooling and family history. All participants in this study completed Part I of the CAADID. Part II of the CAADID is a semi-structured interview that is used to assess ADHD symptomatology in those adults already suspected to have attentional problems. Part II of the CAADID was administered by a trained researcher to all participants in the ADHD group but not those in the control group. The CAADID has been demonstrated to have good overall psychometric properties such as kappa coefficient values ranging from .67 and .69 for current adult diagnosis and childhood diagnosis, respectively (Epstein and Kollins, 2006), which are levels consistent with other structured interviews for DSM-IV Axis I disorders (e.g. Williams et al., 1992). The use of both the CAADID and the CAARS (and the method of use), are consistent with the practice parameters

of the guidelines of the Academy of Child and Adolescent Psychiatry (AACAP; Dulcan et al., 1997).

*Comorbid Psychopathology.* All participants were administered the *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version (SCID-I)* in order to assess for the presence of significant psychiatric symptomology. The SCID-I (First et al., 2002) is a comprehensive structured interview that includes screening modules for: mood, anxiety, psychosis, substance abuse, and eating disorders, according to the diagnostic parameters of the DSM-IV-TR (American Psychiatric Association, 2000). The SCID-I takes approximately 60-90 minutes to administer and has good demonstrated psychometric properties including improved diagnostic accuracy over routine diagnostic interviews and even greater accuracy when combined with a chart review ( $\kappa = 0.76$ ) (Basco et al., 2000). In addition to the SCID-I, the participants completed a further three psychometric measures in order to provide normative (and severity) measures of mood, anxiety and substance abuse symptoms. These included firstly; The Depression, Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1993). The DASS is a 42-item questionnaire which takes approximately 10 minutes to complete and assesses an individual's level of symptoms relating to depression, anxiety and stress that has repeatedly been shown to have excellent psychometric properties (Brown et al., 1997; Antony et al., 1998). In addition, the Michigan Alcoholism Screening Test (MAST; Selzer, 1971) and the

Drug Abuse Screening Test (DAST: Skinner, 1982), was administered to all participants. The MAST is a 5-minute self-administered questionnaire that measures current and lifetime alcohol-related problems, with good psychometric properties ( $\alpha = 0.86$ ) and excellent correlation with the DSM-IV (Conley, 2001). The DAST is a 5-minute self-report measure that assesses an individual's current and life-time use of classified and prescription drugs with sound psychometric properties (Yudko et al., 2007).

*Self-destructive behaviours.* Three variables were chosen to measure self-destructive behaviours in this study. These behaviours were: deliberate self-harm behaviours (without suicidal intent), recurrent suicidal ideation, and past suicidal attempts. Self-harm behaviours were assessed by The Deliberate Self-Harm Inventory (DSHI; Gratz, 2001), which was administered to all participants. The DSHI (Gratz, 2001) is a 15-minute self-report questionnaire with high internal consistency and adequate levels of validity and reliability (Fliege et al., 2006), that assesses an individual's history of self-harm behaviours as well as the frequency, severity duration and type of those behaviours. Deliberate self-harm was defined as some self-injurious behaviour performed without the intention of ending one's own life. Recurrent suicidal intention was assessed by Q.9 of the Mood Episodes section of the SCID-I (First et al., 2002): "were things so bad that you were thinking a lot about death or that you would be better off dead? What about thinking of hurting

yourself?” This SCID-I screening question related to both current and past mood episodes and was asked of all participants (regardless of presence of mood disorder). If participants assented in any way, the following part of question 9 was posed regarding past suicidal attempts: “did you do anything to hurt yourself?” (First et al., 2002). Answers to the above questions were additionally coded if a suicide plan had been present, and the number of self-reported suicidal attempts was recorded. A suicide attempt was defined as some act performed with the intention to end one’s life with some belief in the lethality of the method used.

*Risk Taking Behaviours.* To assess the level of safety and self-protective behaviours between the groups, all participants were administered the Adult Risk Taking Questionnaire (ART-Q), a self-report questionnaire developed by the author that includes questions from the Youth Risk Behaviour Survey (YRBS; CDC, 2007). The YRBS is a questionnaire that is part of the Youth Risk Behaviour Surveillance System undertaken by the Centre for Disease Control and Prevention (U.S.A Government). As the YRBS is in the public domain, the CDC give permission for questions in the YRBS to be used and modified without condition. Questions from the YRBS was adapted for this study in two ways: firstly, the questions were expanded and modified to reflect risk-taking behaviours in *adulthood*: for example, the introduction to each question was changed from “During the last 12 months...” as used in the YRBS, to “From the time you turned

18...” in the ARTQ. The YRBS section on school bullying behaviour was also omitted given the age-range selected in the ART-Q, as were any questions relating to school behaviour. Secondly, as the YRBS was developed for use with a North American sample, some changes were made to represent risk taking behaviour in a New Zealand context. For example, idiomatic language was removed or modified (e.g. brand names of prescription drugs such as Percocet or Vicodin were removed and replaced with more generic terminology). In addition, further questions were added that seemed particularly relevant for an adult New Zealand context (such as use of mobile phone while driving and history of injury resulting from road crossing behaviour). Finally, questions in the YRBS that related to diet and exercise behaviour were not included as those areas were assessed in other questionnaires (mentioned below). The complete modified questionnaire used in this study contained 37 questions, divided into 6 subsections (personal safety, violence, alcohol use, nicotine use, illicit drug use, and sexual risk taking) and takes approximately 15 minutes to complete. The Personal Safety subscale consisted of 7 items ( $\alpha=.70$ ); the Violence subscale consisted of 4 items ( $\alpha=.70$ ); the Alcohol use subscale consisted of 4 items ( $\alpha=.70$ ); the Nicotine use subscale consisted of 3 items ( $\alpha=.63$ ); the Drug Use subscale consisted of 6 items ( $\alpha=.80$ ) and the Sexual Risk subscale consisted of 13 items ( $\alpha=.83$ ). Overall, the internal reliability of the ART-Q was very good ( $\alpha=.89$ ). In addition, the Drug Use and the Alcohol Use subscales

of the ART-Q were compared with responses to the Drug Abuse Screening Test (DAST; Skinner, 1982) and the Michigan Alcohol Screening Tests (MAST; Selzer, 1971) yielding high validity scores of  $r = .80, p < .001$  and  $r = .61, p < .001$ , respectively. The Sexual Risk subscale unfortunately did not correlate highly with scores on other validated measures of sexual risk taking, such as the Sexual Risk Taking Questionnaire (SHQ; Cupitt, 1998, see below); indicating that this index of the ART-Q may not be a valid measure of sexual risk taking ( $r = .27, p < .02$ ). As such, the SHQ was used to measure sexual risk taking in this study.

*Sexual Risk Taking.* The Sexual History Questionnaire (ibid, 1998) was also administered to all participants. The SHQ is a self-administered questionnaire that assesses the degree to which an individual has engaged in *recent* sexual activity that increases the risk of contracting a sexually transmitted infection (STI). While Cupitt's (1998) original questionnaire referred to a time-frame of sexual activity within "the previous month" it was felt that this time frame was too short for this study, given the older average age of participants and the potentially lower frequency of sexual activity in general (Seidman & Rieder, 1994). The questionnaire includes questions regarding; the number of sexual partners within the past 6 months, the proportion of times that participants had unprotected sex, and whether participants had engaged in sexual activity that they believed may have been infected with an STI. Consistent with other sexual behaviour questionnaires,

very little psychometric data exists regarding the SHQ. However, Cupitt (1998) measured the test-retest reliability of the test at 0.80 indicating a high level of reliability.

*Health Risk Behaviours.* General health status and accidental injury history was assessed using the 2002 SLÁN Health and Lifestyle Questionnaire (Survey of Attitudes Lifestyle and Nutrition; Kelleher et al., 2003). This questionnaire, used by the Republic of Ireland in a national health screening study, assesses factors such as frequency and intensity of exercise, food habits and history of accidental injury (type, severity, context, etc.). In this study, the SLÁN is used as a self-report measure, taking approximately 20minutes to complete. The SLÁN survey provided a basis for 62 questions that were grouped into four subsections: general health status; exercise; accidents & injuries; and food habits. The SLÁN has moderate levels of established validity and reliability (Kelleher et al., 2003).

*Dysfunctional eating behaviour.* Dysfunctional patterns in eating were assessed using the Eating Attitudes Test (EAT; Garner & Garfinkel, 1979), a 40-item scale which takes approximately 10 minutes to complete and yields subscale scores based on dieting, oral control, and bulimia/ food preoccupation. In this study a stringent cut-off score of 30 or over was used to indicate problematic attitudes

towards eating and/or the possible presence of an eating disorder. The EAT has good demonstrated validity and reliability ( $\alpha = .94$ ; Garner & Garfinkel, 1979).

*Psychosocial Functioning.* The Global Assessment of Recent Stress (GARS; Linn, 1985) was administered to all participants. The GARS is a 5-minute self-report measure with good levels of reliability and validity (Linn, 1985), which measures participants' level of *current* stress. Similarly, the Coping Inventory for Stressful Situations (CISS; Endler & Parker, 1990) was administered to all participants. The CISS is a 10-minute self-report measure with good reported psychometric properties (Endler & Parker, 1990) which measures an individual's level of coping associated with stressful events as well as coping style (task-oriented, emotion-oriented or avoidance-oriented). Current levels of social support were assessed through administration of the Social Support Questionnaire short form (Sarason et al., 1987) a brief measure that assesses both the quantitative and qualitative elements (network size and satisfaction) of an individual's social support. The scale is comprised of 6 ratings scales of satisfaction regarding key relationships (a rating of 1 corresponds to "very dissatisfied", whereas a rating of 6 corresponds to "very satisfied"). These significant relationships are defined using qualifying questions such as: "who can you really count on to care about you, no matter what is happening to you", and "whom can you really count on to be dependable when you need help?" (Sarason et al., 1987). The SSQ has excellent demonstrated reliability

.94 to .97).and validity (.83 to .90) properties (Sarason et al., 1983) and correlates highly with the long form, particularly with a New Zealand sample (Siegert, Patten & Walkey, 1987).

*History of Childhood Abuse*. the Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) was administered to all participants. The CTQ is a self-report measure with good internal consistency and test-retest reliability (Paivio & Cramer 2004) that assesses the occurrence of childhood trauma, differentiating between emotional, physical and sexual abuse while excluding experiences of non-abuse related traumatic events such as death of a parent.

### *Experimental Measures*

*Reward Sensitivity.* Motivational variances between the groups were measured through the use of a computer generated passive avoidance learning (PAL) experiment based on that conducted by Farmer and Rucklidge (2006) with permission from the authors. The PAL task involves trial and error learning of a go/no-go task with contingent reinforcement; participants received positive visual feedback (“*correct*”) and a small reward (ten cent coin) for each correct response and negative feedback (“*wrong*”) and a withdrawal of a reward (10c coin) for each incorrect response. In this study, all participants were introduced to the task with written instructions that were read aloud by the researcher, followed by a pre-treatment trial in which a series of 6 target numbers appears on the computer screen, interspersed with non-target numbers. In the pre-treatment trial, target numbers and non-target numbers were set at a ratio of presentation of 1:3; in order to increase learning success. Participants learned via reinforcement (visual feedback “*correct*” or “*wrong*”) which of the numbers presented were target numbers, and which were not. The pre-treatment trial involved the presentation of 18 numbers (of which 6 were target numbers). This was followed by the treatment trials in which 32 numbers were presented, including the 6 target numbers which were presented at a 1:1 ratio with random non-target numbers. Participant responses (pressing of the space bar) were recorded, in addition to response time. Learning performance on

this task was measured by the rate of *passive avoidance errors (PAE)*; specifically, errors of commission (responding incorrectly or failing to abstain) or omission (failing to respond).

*Temporal Discounting.* The second motivational variable assessed in this study was temporal discounting, as measured by a further computer generated experiment. This experiment was modelled on the Reward Discounting Task (RDT) conducted in card form by Barkley et al., (2001) and Green et al., (1994). In this experiment, participants were asked to make a series of choices (between Option A and Option B) based on fictional amounts of money presented to them on the screen. The assumption was that individuals with greater difficulty with delaying gratification in their lives were more likely to prefer the option of more immediate gains (option A) versus the delayed option (option B). The instructions for this task were presented visually on the computer screen (“please choose between option A and option B. Press the ‘A’ key for option A or the ‘B’ key for option B”) and verbally read by the researcher. The participants also received a visual prompt (at the bottom of the computer screen) to press the space bar when ready to proceed. Once initiated, the program presented a series of screens (96 in total) with various conditions to the above choice task (different money amounts and different time delays). The speed of the rotation through conditions was controlled by the response time of each participant (a new screen emerged once either the A or B key was

pressed). In the first condition, participants were presented with a choice between a static option A: (\$100 in one month) versus option B: *ascending* amounts of money that were immediately available (1, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 100). This condition was then presented in reverse order (the option B values *descended* from \$100-\$1 whilst paired with the same option A: \$100). In the second condition, Option A was set at \$100 *in one year* and was paired with the same ascending immediate rewards and then descending rewards. In the third condition, the time delay of option B was set at 5 years; and in the fourth condition, the delay was 10 years. This was followed by a second trial which used larger amounts of money for option A (\$1000) and option B: (\$10 now, \$100 now, then \$200 now and so on up to \$1000). These larger amounts were similarly followed by the same conditions in reverse, descending order. In total, there were 8 conditions measured, with an associated total of 12 responses per condition. The participants' scores were the immediate reward values at which the participant switched from a preference for the delayed sum of money (option A) for the immediate sum (option B) and the same in reverse for the descending trials (score at which they switched from option B to option A). While the reliability of this task had not been established when utilised by Barkley et al., (2001), validity had been partially established by Green et al., (1994). More recent evidence of reliability or validity could not be found. However, the task is very similar in form to the Computerized discounting procedure developed by

Richards et al., (1999) of which reliability and validity adequacy has been established (Richards et al., 1999).

### 2.3 Procedure

Initial telephone interviews were used as a preliminary screen for inclusion/ exclusion criteria followed by a mailed participant pack, containing an information sheet, consent form and self-report screening tools. Those who met inclusion criteria were then invited to take part in face-to-face assessment interviews at the University of Canterbury. All participant interviews were conducted in a postgraduate research block at the University Of Canterbury Department of Psychology. Interviewers were senior postgraduate students or registered clinical psychologists. All participants received grocery or petrol vouchers as reimbursement for their time (\$30). Interviewers completed the following measures in two face-to-face interviews (roughly 2.5 hours each session): the Wechsler Abbreviated Scales of Intelligence (WASI; Wechsler, 1999), the Conner's Adult ADHD Diagnostic Interview for DSM-IV (CAADID; Epstein, Johnson, & Conners, 2002) Part II (the diagnostic second part of the CAADID was administered only to those that met initial criteria for ADHD group), and the Structured Clinical Interview for DSM-IV-TR Axis 1 Disorders, Research Version (SCID-I). As an adjunct to the administration of the SCID-I, participants were carefully screened for life-time self-harm and suicide behaviours. Participants were then asked to complete the self-report questionnaires at their leisure, before returning for their second interview at the university. All participants (ADHD and control group) who

completed the research received a complete psychological assessment report. The purpose of this report was for the outcome of the psychological assessment to be communicated to the participants' general practitioners and other health care providers.

### *Statistical Analysis*

*I- Adult ADHD and Self-destructive Behaviours:* It was hypothesized that ADHD symptomatology is related to self-harm and suicidal behaviour, both directly and indirectly via psychosocial variables. ADHD symptomatology has a direct effect on self-harm and suicidal ideation and suicidal attempts and also acts indirectly via psychosocial outcomes including comorbid psychopathology (mental health) and coping behaviours. To investigate the hypothesis that psychosocial variables may mediate the relationship between ADHD and self-destructive behaviours, firstly bivariate associations between ADHD and the self-destructive behaviours (suicidal attempts, ideation and self-harm) were tested. Secondly, bivariate associations between potential mediators (coping behaviours and comorbidity) and self-destructive behaviours were tested.

### *II- Motivational Variances and Risk Taking Among Adults with ADHD:*

It was further hypothesized that ADHD symptomatology is related to rates of risk-taking behaviours both directly and indirectly via motivational variances. ADHD symptomatology has a direct effect on risk taking in areas such as: personal safety; social violence; sexual risk taking; and substance use. It was also hypothesized that ADHD symptomatology acts indirectly via motivational variances including: sensitivity to reward and punishment, and temporal discounting. To investigate the hypothesis that motivational variances may mediate the relationship between ADHD

and risk-taking behaviours, firstly bivariate associations between ADHD and the risk-taking behaviours (personal safety; social violence; sexual risk taking; and substance use) were tested. Secondly, bivariate associations between potential mediators (motivational variances) and risk-taking behaviours were tested.

### *III- Psychological Outcomes Associated with ADHD and Comorbid*

*Childhood Abuse Victimization:* It was thirdly hypothesized that comorbid abuse victimisation in childhood moderates the effect of ADHD symptomatology on negative psychological outcomes in Adults. ADHD symptomatology has a direct effect on psychological outcomes such as increased rates of mood, anxiety and substance abuse disorders. It was also hypothesized that ADHD symptomatology can act indirectly on these outcomes via experience of childhood abuse (particularly physical or emotional abuse), i.e., comorbid child abuse victimization increases the risk of latter negative psychological outcome in adulthood. To investigate the hypothesis that childhood abuse victimisation may moderate the relationship between ADHD and negative psychological outcomes in adulthood; firstly bivariate associations between ADHD and psychological comorbidity in adulthood (mood, anxiety and substance use disorders) were tested. Secondly, bivariate associations between the potential moderators (experience of childhood physical, emotional and sexual abuse and neglect) and adult psychological outcomes were tested.

*IV- Adult ADHD and Physical Health Outcomes:* It was lastly hypothesized that ADHD symptomatology is related to negative health outcomes, both directly and indirectly via psychosocial variables. ADHD symptomatology has a direct effect on negative health outcomes such as poor diet and nutrition, eating pathology, poor dental health and lower activity levels, and also acts indirectly via psychosocial outcomes including comorbid psychopathology (mental health), and social support and stress levels. To investigate the hypothesis that psychosocial variables may mediate the relationship between ADHD and physical health, firstly bivariate associations between ADHD and the physical health variables (diet, activity level, chronic illness/ disability, and dental health) were tested. Secondly, bivariate associations between potential mediators (comorbidity, social support and stress levels) were tested.

*Confounding Variables:* In order to test whether any of the above results may be due to an intervening variable, a number of other variables were tested for covariance with ADHD using one-way analysis of variance. The confounders tested included: gender, socio-economic status, ethnicity, intellectual ability, and conduct disorder symptoms. For all of the above analyses, any  $p$  values less than .05 were considered statistically significant.

*Testing Intervening Pathways:* In the next step of the analyses, the possibility that the pathways between ADHD and self-destructive behaviours may be mediated by psychosocial variables (hypotheses I); was examined through the use of bootstrapping of indirect effects via latent variable SEM (Muthen & Muthen, 2007). The possibility that child abuse victimisation may have a moderating effect on the association between ADHD and later psychopathology (hypothesis II) and that motivational factors may mediate the path between ADHD and risk-taking behaviours (hypothesis III); was tested using bootstrapping of indirect effects via ordinary least squares (OLS) regression (Preacher & Hayes, 2008). An issue arising from many of the more common mediational approaches (such as the Sobel test: Sobel, 1982) is that these approaches assume a normal distribution amongst both predictors and outcomes (see Hayes, 2009, for a discussion of these issues), whereas bootstrapping of indirect effects via latent variable structural equation modelling or OLS regression (SEM; e.g. Muthen & Muthen, 2007; Preacher & Hayes, 2008) does not make assumptions of normality. In these approaches, bootstrapping is used to estimate bias-corrected confidence intervals for each direct and indirect effect in the model, thereby reducing the risk of Type II error and increasing the power of the model to detect effects. Furthermore, these approaches allow the specification of more complex models with multiple mediating pathways (see below). The bootstrapping approach is particularly appropriate for the present analyses as they

employ a mixture of variable scales, including dichotomous outcomes and ordinal and continuous predictors, and in several cases the models employ two intervening variables simultaneously.

In these models, both the ordinal mental health disorders variable and the emotion-focussed coping variable from hypothesis I were employed as intervening variables in the association between ADHD and each of the three self-harm/suicidality outcomes (for suicide attempts, only a single intervening variable, mental health disorders, was employed). For hypothesis II, both the ordinal reward sensitivity and temporal discounting variables were employed as intervening variables in the association between ADHD and each of the four risk-taking outcomes (personal safety; social violence; sexual risk taking; and substance use). For the third hypothesis, the ordinal child abuse variable was employed as an intervening variable between ADHD and each of the mental health outcomes (mood, anxiety and substance abuse disorders). Finally, for hypothesis IV, the ordinal variables of social support and stress were employed as intervening variables between ADHD and each of the physical health outcomes (diet, activity level, chronic illness/ disability, and dental health). Bootstrapping latent variable models were fitted using MPlus V. 5 (Muthen & Muthen, 2007) or the mediation macro developed for SPSS Statistics 19 (Preacher & Hayes, 2008). Both methods were used interchangeably in this study, due to their equivalence in testing mediation

(Preacher & Hayes, 2008). In these models, effects were estimated for the direct pathway between ADHD and each outcome, as well as the indirect pathways via mediators/ moderators, using Weighted Least Squares and Delta parameterisation (Muthen & Muthen, 2007) or Ordinary Least Squares (Preacher & Hayes, 2008). The models also provided tests of statistical significance for each direct and indirect pathway in the model. All of the above models test *relationships* between ADHD and outcomes and possible intervening pathways via various mediators/moderators. Despite the fact that regression models are employed, causality in these models is not claimed or assumed. There is a well-persuaded argument that mediation analyses do not necessarily infer causation (Provine, 1986; Bollen & Pearl, 2012) particularly when there is not enough empirical support for such claims (as is the case for ADHD research).

## RESULTS

### 3.1 Sample Characteristics

The final sample consisted of 66 adults (35 ADHD, 31 controls). The mean age of both the control group and the ADHD group was 33 years (32.76 [SD=12.67] and 32.55 [SD=10.84], respectively). The gender ratio of both groups was between 1:1.8 and 1:1.9 females/males and mean FSIQ (WASI) scores for both the control and ADHD groups were 120 (SD=11.27 and SD=15.15, respectively). The NZSEI (socioeconomic status) scores of both the control and ADHD groups were low but commensurate (25.7 [SD=22.8] and 27.9 [SD=21.5], respectively). Of the ADHD group, 13 (37%) met criteria for ADHD Predominantly Inattentive Type, 21 (60%) met criteria for ADHD, Combined Type and one met criteria for ADHD Predominantly Hyperactive Type (3%).

### *Descriptive Statistics*

Descriptive statistics including means, standard deviations and frequencies of self-reported life-time psychiatric diagnoses and psychosocial variables of both groups are summarized in Table 1 below. Participants in the ADHD group reported higher levels of life-time self-harm, suicidal ideation and suicidal attempts than participants in the control group. In addition to higher levels on psychosocial variables such as rates of depressive disorders, substance abuse, childhood emotional abuse, adults with ADHD were more likely to report responding with more emotional ways of responding to stress (as assessed by the Coping in Stressful Situations Scale; CISS; Endler & Parker, 1990) and were likely to rate higher levels of current stress overall (as measured by the Global Assessment of Recent Stress; GARS; Linn, 1985). Participants in the ADHD group also reported lower levels of current social support, as measured by the Social Support Questionnaire- Short form (Sarason et al., 1987).

**Table 1. Descriptive Statistics Including Rates of Dependent Variables**

	ADHD Group		Control Group		Total		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
<b>Self-Harm</b>	18	51%	9	29%	27	40%	.02
<b>Suicidal Ideation</b>	21	60%	5	16%	26	39%	.004
<b>Suicidal Attempts</b>	7	20%	2	7%	9	14%	.004
<b>Alcohol Abuse Disorders</b>	16	46%	6	19%	22	33%	.000
<b>Drug Abuse Disorders</b>	12	34%	3	10%	15	23%	.001
<b>Mood Disorders</b>	27	77%	11	35%	38	58%	.000
MDD	24	69%	11	35%	35	53%	
Bipolar Disorders	3	9%	0	0%	3	5%	
<b>Anxiety Disorders</b>	19	54.3%	6	19.4%	25	37.9%	<i>n.s</i>
Social Phobia	7	20%	1	3%	8	12%	
GAD	7	20%	2	6%	9	14%	
Panic Disorder	2	6%	0	0%	2	3%	
PTSD	3	9%	5	16%	8	12%	
Specific Phobia	2	6%	0	0%	2	3%	
OCD	4	11%	0	0%	4	6%	
	ADHD Group			Control Group			
	<i>n</i>	Mean	Std Dev	<i>n</i>	Mean	Std Dev	
<b>ART-Q Personal Safety</b>	35	50.52	10.84	31	49.41	9.10	<i>n.s</i>
<b>ART-Q Violence Risk</b>	35	53.11	11.35	31	46.78	8.67	.001
<b>ART-Q Alcohol Use</b>	35	50.95	11.06	31	48.92	8.70	.048
<b>ART-Q Nicotine Use</b>	35	52.19	10.82	31	47.53	8.49	.002
<b>ART-Q Drug Use</b>	35	51.59	10.79	31	48.21	8.86	.030
<b>SHQ Sexual Risk Taking</b>	35	52.46	9.38	31	47.23	10.09	.001
<b>EOC Emotion Oriented Coping</b>	32	49.69	10.65	31	37.35	11.42	.002
<b>TOC Task Oriented Coping</b>	32	45.03	8.93	31	56.87	12.14	.000
<b>AOC Avoidant Oriented Coping</b>	32	41.91	9.86	31	40.90	8.92	<i>n.s</i>

	ADHD Group			Control Group			<i>p</i>
	<i>n</i>	Mean	Std Dev	<i>n</i>	Mean	Std Dev	
<b>CTQ Emotional Abuse Score</b>	35	11.86	5.22	31	8.55	4.11	.002
<b>CTQ Physical Abuse Score</b>	35	8.00	2.87	31	6.90	3.72	.009
<b>CTQ Sexual Abuse Score</b>	35	6.29	3.58	31	7.06	5.43	<i>n.s</i>
<b>CTQ Emotional Neglect score</b>	35	11.71	4.56	31	10.06	4.43	<i>n.s</i>
<b>CTQ Physical Neglect Score</b>	35	6.31	1.66	31	6.71	3.56	<i>n.s</i>
<b>DAST Drug Abuse Screening Test</b>	34	3.41	4.95	31	1.84	3.99	.011
<b>MAST Michigan Alcohol Screening Test</b>	34	4.56	4.94	31	2.48	2.22	.005
<b>GARS Global Assessment of Recent Stress</b>	35	36.40	13.90	30	27.47	10.31	.000
<b>SSQ Social Support Questionnaire</b>	35	47.43	20.50	30	53.90	18.78	<i>n.s</i>
<b>DASS Depression Anxiety Stress Scale Depression Score</b>	33	12.85	11.12	31	5.19	7.14	.000
<b>DASS Depression Anxiety Stress Scale Anxiety Score</b>	33	6.88	8.03	31	2.90	3.78	.001
<b>DASS Depression Anxiety Stress Scale Stress Score</b>	33	16.94	10.24	31	7.71	7.89	.000
<b>RDT Temporal Discounting Task</b>	35	245.64	132.51	30	285.36	104.72	.001
<b>PAL Reward Sensitivity Task</b>	35	53.69	10.56	31	45.84	7.52	.02

*Confounding Variables*

A number of additional variables were also tested as possible confounding variables using one-way between subjects ANOVA. These variables included: gender, ethnicity, IQ, socioeconomic status, and conduct disorder symptomatology. All variables proved to be nonsignificant as confounders, as summarized in Table 2.

**Table 2. Bivariate Associations between ADHD and Confounding Variables**

		ADHD Severity Quartiles					
Confounding Variables		1-25%	26-50%	51-75%	76-100%	Total	<i>p</i>
<b>Female</b>							
	<b>n</b>	5	6	8	4	23	.92
	<b>%</b>	21.74	26.09	34.78	17.39		
<b>Non-European/ Pakeha</b>							
	<b>n</b>	3	1	1	1	6	.78
	<b>%</b>	50	16.67	16.67	16.67		
<b>low SES</b>							
	<b>n</b>	9	11	9	12	41	.92
	<b>%</b>	21.95	26.83	21.95	29.27		
<b>low IQ</b>							
	<b>n</b>	0	2	3	2	7	.90
	<b>%</b>	0	28.57	42.86	28.57		
<b>Conduct problems</b>							
	<b>n</b>	6	1	2	8	17	.27
	<b>%</b>	35.29	5.88	11.76	47.06		

### 3.3 Item Analyses

#### *Phase I: Adult ADHD and Self-destructive Behaviours:*

*Bivariate Associations:* Bivariate associations between ADHD and self-destructive behaviours and between mediators and self-destructive behaviours are reported in Tables 3 and 4 (below). Overall, ADHD was associated with self-harm ( $\beta=.041$ ,  $p=.017$ ), indicating that adults with ADHD were more likely to have engaged in self-harm behaviours across the life-span (51% compared with 29%). A significant association was also found between ADHD and suicidal ideation ( $\beta=.052$ ,  $p=.004$ ), indicating that adults with ADHD experienced higher rates of ideation (60%) compared with controls (16%). A significant association was also found between ADHD and the number of previous suicidal attempts ( $\beta=.011$ ,  $p=.004$ ), indicating that those adults with ADHD were significantly more likely to have attempted suicide (20%) in the past than controls (7%). In addition, ADHD was significantly associated with the psychosocial factors, mental health comorbidity ( $\beta=.63$ ,  $p=.013$ ) and emotion focused coping ( $\beta=.094$ ,  $p=.002$ ). In turn, mental health comorbidity is significantly associated with self-harm, ( $\beta=.68$ ,  $p=.003$ ) suicidal ideation ( $\beta=1.18$ ,  $p=.000$ ) and suicidal attempts ( $\beta=.67$ ,  $p=.005$ ). Emotion focused coping style is also significantly associated with self-harm ( $\beta=.096$ ,  $p=.001$ ), suicidal ideation ( $\beta=.086$ ,  $p=.002$ ) but not with suicidal attempts.

**Table 3. Bivariate Associations between ADHD and Self-destructive Behaviours**

ADHD Severity Quartiles						
Self-destructive behaviours	1-25%	26-50%	51-75%	76-100%	Total	<i>p</i>
<b>Self-Harm</b>						
n	3	7	7	10	27	.02
%	11.11	25.93	25.93	37.04		
<b>Suicidal Ideation</b>						
n	4	2	10	10	26	.004
%	15.38	7.69	38.46	38.46		
<b>Suicidal Attempts</b>						
n	1	1	2	8	12	.004
%	8.33	8.33	16.67	66.67		

**Table 4. Bivariate Associations between Psychosocial Mediators and Self-destructive Behaviours**

Mediating Variables							
Self-destructive behaviours	Mental Health Comorbidities (cumulative)					Total	<i>p</i>
	0	1	2	3	4+		
<b>Self-Harm</b>							
n	4	5	9	6	4	28	.003
%	14.29	17.86	32.14	21.43	14.29		
<b>Suicidal Ideation</b>							
n	1	4	11	7	4	27	.000
%	3.70	14.81	40.74	25.93	14.81		
<b>Suicidal Attempts</b>							
n	0	3	4	3	3	13	.002
<b>Emotional Oriented Coping Style (percentile)</b>							
Self-Harm	0-20%	21-40%	41-60%	61-80%	81-100%	Total	<i>p</i>
	n	1	3	4	9	10	27
%	3.70	11.11	14.81	33.33	37.04		
<b>Suicidal Ideation</b>							
n	2	1	5	7	10	25	.002
%	8.00	4.00	20.00	28.00	40.00		

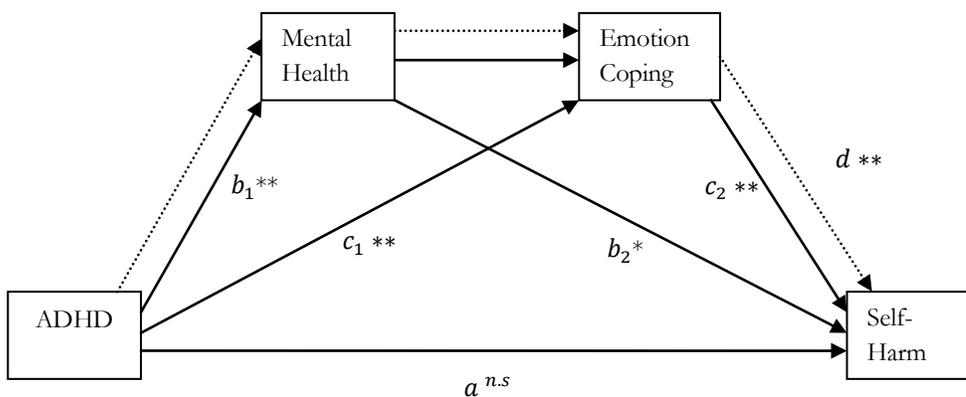
### *ADHD and Self-Harm*

As noted above, the extent to which mental health disorders and emotion focussed coping mediated the linkages between ADHD and self-harm was examined using bootstrapping of indirect effects via latent variable SEM (Muthen & Muthen, 2007). In this procedure, the data were modelled with a single direct pathway between ADHD and self-harm, and two indirect pathways between ADHD and self-harm, the first via the mental health disorder count measure, and the second via the emotion focussed coping measure (see Figure 2). The results of this modelling showed:

1. There were statistically significant pathways between ADHD and both mental health ( $\beta = 1.13$ ,  $SE = .32$ ,  $p < .0001$ ) and emotion-focussed coping ( $\beta = 12.33$ ,  $SE = 2.73$ ,  $p < .0001$ ), and statistically significant pathways to self-harm from both mental health ( $\beta = .43$ ,  $SE = .16$ ,  $p < .01$ ) and emotion-focussed coping ( $\beta = .05$ ,  $SE = .01$ ,  $p < .0001$ ). However, there was no evidence of a statistically significant *direct* pathway from ADHD to self-harm ( $\beta = -.5$ ,  $SE = .37$ ,  $p > .10$ ).
2. Overall tests of the mediating pathways via mental health and via emotion-focussed coping were found to be statistically significant (mental health:  $\beta = .48$ ,  $SE = .20$ ,  $p < .05$ ; emotion-focussed coping:  $\beta = .61$ ,  $SE = .19$ ,  $p < .01$ ).

A test of the total indirect effect via both mediating factors was also found to be statistically significant ( $\beta = 1.09$ ,  $SE = .29$ ,  $p < .0001$ ).

**Figure 2.** Mediation model showing the single direct pathway between ADHD and self-harm (a), and two indirect pathways between ADHD and self-harm, the first via the mental health variable (b), the second via the emotion coping variable (c). The total indirect effect via both mediating factors is also shown (d).



**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant ( $p < .05$ ), \*\* = highly significant ( $p < .01$ ), m = marginally significant

The results of these analyses suggest that the linkages between ADHD and self-harm were mediated by mental health disorders and emotion-focused coping. Those individuals with higher ADHD scores were at greater risk of self-harm, and this risk could be largely explained by a greater burden of mental health disorder comorbidity, and a greater tendency to use emotion-focused coping methods amongst those with higher ADHD scores.

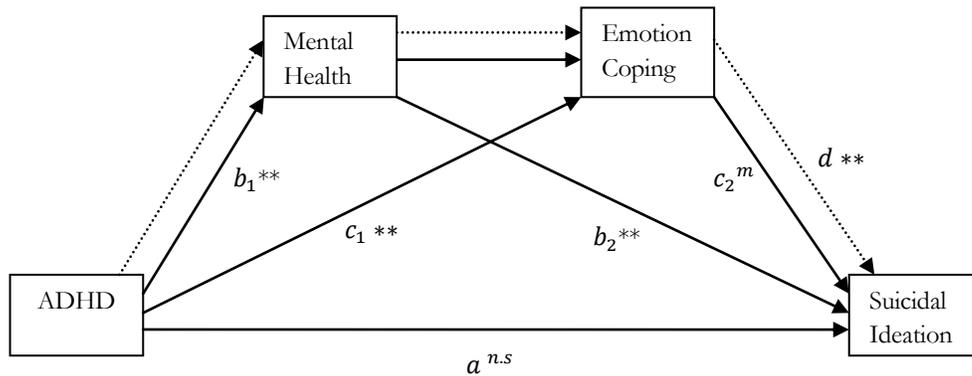
*ADHD and Suicidal Ideation*

In the second procedure, bootstrapping of indirect effects via latent variable SEM (Muthen & Muthen, 2007) was also utilised to examine the extent to which mental health disorders and emotion-focused coping mediated the relationship between ADHD and suicidal ideation. Similar to the aforementioned model, the data were modelled with a single direct pathway between ADHD and suicidal ideation, and two indirect pathways between ADHD and suicidal ideation, the first via the mental health disorder count measure, and the second via the emotion focussed coping measure (see Figure 3). The results of this modelling showed:

3. The same statistically significant pathways between ADHD and both mental health and emotion-focussed coping applied to this model (see point 1). Statistically significant pathways to suicidal ideation from both mental health ( $B = .61$ ,  $SE = .12$ ,  $p < .0001$ ) and emotion-focussed coping ( $B = .03$ ,  $SE = .02$ ,  $p < .05$ ) were also evident. Similar to the model above, there was no evidence of a statistically significant *direct* pathway from ADHD to suicidal ideation ( $B = .17$ ,  $SE = .43$ ,  $p > .10$ ).
4. Overall tests of the mediating pathways via mental health were again found to be statistically significant ( $B = .68$ ,  $SE = .26$ ,  $p < .01$ ) and marginally

significant via emotion-focussed coping: ( $B = .39$ ,  $SE = .20$ ,  $p = .056$ ). A test of the total indirect effect on suicidal ideation via both mediating factors was also found to be statistically significant ( $B = 1.07$ ,  $SE = .33$ ,  $p < .001$ ).

**Figure 3. Mediation model showing the single direct pathway between ADHD and suicidal ideation (a), and two indirect pathways between ADHD and suicidal ideation, the first via the mental health variable (b), the second via the emotion coping variable (c). The total indirect effect via both mediating factors is also shown (d).**



**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant ( $p < .05$ ), \*\* = highly significant ( $p < .01$ ), m = marginally significant

The results of these analyses suggest that the linkages between ADHD and suicidal ideation were also mediated by mental health disorders and emotion-focussed coping. Those individuals with higher ADHD scores were at greater risk of suicidal ideation, and this risk could be largely explained by a

greater burden of mental health disorder comorbidity, and a greater tendency to use emotion-focussed coping methods amongst those with higher ADHD scores.

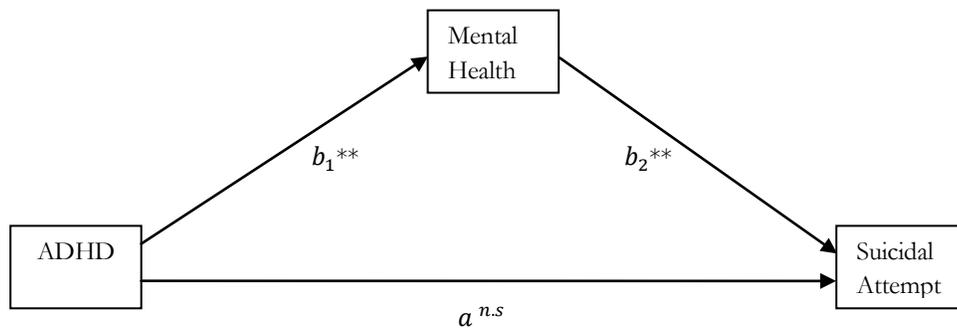
### *ADHD and Suicidal Attempts*

In the final procedure, the same methods of bootstrapping of indirect effects via latent variable SEM (Muthen & Muthen, 2007) were utilised to examine the extent to which mental health disorders mediated the relationship between ADHD and number of past suicide attempts (emotion-focused coping was not found to be a significant mediator). In this model, the data were modelled with a single direct pathway between ADHD and suicidal attempts, and a single indirect pathway between ADHD and suicidal ideation via the mental health disorder count measure (see Figure 4). The results of this modelling showed:

5. The same statistically significant pathways between ADHD and mental health were repeated in this model (see point 1). Statistically significant pathways to suicidal attempts from mental health ( $B = .43$ ,  $SE = .14$ ,  $p < .003$ ) were also evident. Again similar to the models above, there was no evidence of a statistically significant *direct* pathway from ADHD to suicidal attempts ( $B = .27$ ,  $SE = .40$ ,  $p > .10$ ).

6. An overall test of the total indirect effect on suicidal attempts via mental health was also found to be statistically significant ( $B = .48$ ,  $SE = .23$ ,  $p < .05$ ).

**Figure 4. Mediation model showing the single direct pathway between ADHD and suicidal attempts (a), and a single indirect pathway between ADHD and suicidal attempts, via the mental health variable (b).**

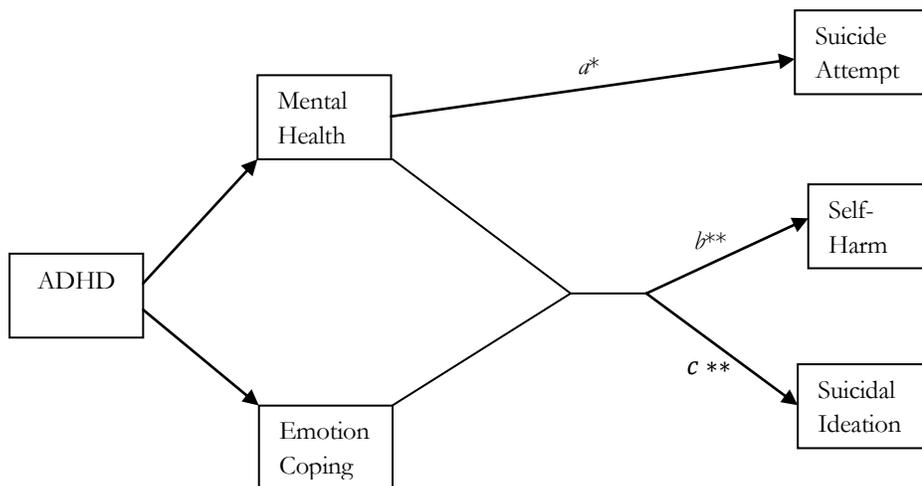


**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant ( $p < .05$ ), \*\* = highly significant ( $p < .01$ ), m = marginally significant

The results of these analyses suggest that the associations between ADHD and suicidal attempts were also mediated by mental health disorders (but not emotion-focussed coping). Those individuals with higher ADHD scores were at greater risk of attempting suicide, and this risk could be largely explained by a greater burden of mental health disorder comorbidity amongst those with higher ADHD scores.

In summary, the mediational models above demonstrate that adults with higher levels of ADHD symptomatology are at a greater risk of self-harm, suicidal ideation and suicide attempts. Furthermore, much of this increased risk may be largely explained by the higher prevalence of mental health comorbidity and except for suicide attempts; emotion-focussed coping tendencies amongst adults with ADHD. See Figure 5 for an overall illustration of these associations.

**Figure 5. Mediation model showing the total indirect effect between ADHD and suicidal attempts (a), self-harm (b) and suicidal ideation (c) via both the mental health and emotion focused coping variables.**



**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant ( $p < .05$ ), \*\* = highly significant ( $p < .01$ ), m = marginally significant

*Phase II: Motivational Variances and Risk Taking in Adult ADHD:*

*Bivariate Associations:* Bivariate associations between ADHD and risk-taking outcomes and reward/ punishment sensitivity measures are summarized in Table 5 and Table 6. In summary, significant associations were found using Spearman's Rank Order correlations, between ADHD and elevated scores on a number of indexes of the Adult Risk Taking Questionnaire (ART-Q), including Violence risk ( $r_s(66) = .39, p = .001$ ), Alcohol use ( $r_s(66) = .21, p = .048$ ), Nicotine use ( $r_s(66) = .35, p = .002$ ), Drug use ( $r_s(66) = .23, p = .03$ ) and Sexual Risk Taking ( $r_s(66) = .40, p = .001$ ) from the SHQ (Cupitt, 1998). Associations between ADHD and Personal Safety Risk on the ART-Q were not found to be significant. These findings indicate that adults with ADHD tend to engage in higher rates of risk-taking behaviours in adulthood that correspond to risk of both perpetration and victimisation of violence and substance use/ abuse. Furthermore, significant associations were found between ADHD and experimental measures of 1) differential reward sensitivity and 2) temporal discounting. ADHD was found to be significantly associated with both commission and omission error scores (which were combined into a Total Error Score) on a Passive Avoidance Learning Task (PAL; Farmer & Rucklidge, 2006), using Spearman's Rank Order correlations ( $r_s(64) = .25, p = .02$ ). In addition, ADHD was significantly negatively associated with Average Discounted Value of Delayed reward on the Reward Discounting

Task (RDT; Barkley et al., (2001), an experiment designed to measure rates of temporal discounting ( $r_s(63) = -.40, p = .001$ ). The results from the PAL task indicated that adults with ADHD tended to respond with greater sensitivity to reward (higher commission errors) and lower sensitivity to punishment (higher omission errors); and the results of the RDT task indicate that adults with ADHD tend to engage in higher rates of temporal discounting (as evidenced by the lower point at which respondents with ADHD chose a more immediate, lower value, reward). Finally, these motivational variances were found to be related to a number of the risk-taking outcomes as measured by the ART-Q. Scores on the Passive Avoidance Learning Task (PAL) were significantly positively associated with scores on the Adult Risk Taking Questionnaire (ART-Q), Violence risk index ( $r_s(64) = .25, p = .02$ ). All other indexes of the ART-Q were not significantly correlated with PAL scores. Participant scores on the RDT task were significantly and negatively associated with a number of ART-Q indexes, including: Violence risk ( $r_s(61) = -.29, p = .01$ ), Nicotine use ( $r_s(61) = -.36, p = .002$ ), and Drug use ( $r_s(61) = -.23, p = .035$ ). The ART-Q indexes of Alcohol use and Personal safety risk, and Sexual Risk Taking scores from the SHQ were not found to be significantly associated with RDT scores.

Table 5. Bivariate Associations between ADHD and Risk-Taking Behaviours

	ADHD Severity Quartiles				n	Total	<i>p</i>
	1-25%	26-50%	51-75%	76-100%			
<b>Psychological Outcomes</b>							
<b>Personal Safety</b>							
mean	48.27	50.11	48.00	53.69	66	50.02	.22
std dev	8.5	9.35	10.90	10.73		9.97	
<b>Violence risk</b>							
mean	45.93	46.56	51.00	57.06	66	50.14	.001
std dev	9.04	7.53	7.11	14.35		10.58	
<b>Alcohol Use</b>							
mean	47.27	51.06	46.18	55.56	66	50.02	.048
std dev	8.17	9.30	8.90	11.37		9.99	
<b>Nicotine Use</b>							
mean	46	48.50	49.82	56.00	66	50.08	.002
st dev	7.66	9.05	9.79	10.88		9.91	
<b>Drug Use</b>							
mean	49	47.17	48.88	54.69	66	49.98	.030
std dev	11.77	5.18	11.89	9.93		10.12	
<b>Sexual Risk Taking (SHQ)</b>							
mean	46.87	47.83	49.35	55.81	66	49.94	.001
std dev	7.50	11.82	6.72	10.70		9.91	

Table 6. Bivariate Associations between Mediating Variables and Risk-taking Outcomes

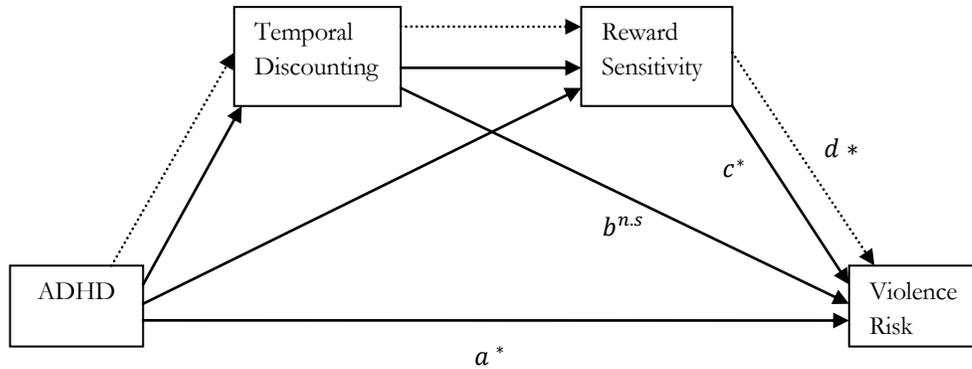
<b>Mediating Variables</b>							
<b>Temporal Discounting (RDT Task)</b>							
<b>Psychological Outcomes</b>	1-25%	26-50%	51-75%	76-100%	n	Total	<i>p</i>
<b>Personal Safety</b>							
mean	51.50	50.93	49.00	49.53	63	50.24	.36
std dev	10.66	10.55	9.53	10.04		10.02	
<b>Violence risk</b>							
mean	55.33	50.43	47.00	47.27	63	50.01	.01
std dev	14.82	8.46	7.76	7.87		10.78	
<b>Alcohol Use</b>							
mean	52.28	51.64	47.00	50.53	63	50.36	.16
std dev	9.29	11.69	8.48	10.98		10.06	
<b>Nicotine Use</b>							
mean	56.11	49.36	44.50	49.13	63	49.78	.002
std dev	9.73	8.63	8.27	9.30		9.83	
<b>Drug Use</b>							
mean	54.28	47.57	45.50	51.73	63	49.77	.035
std dev	11.68	5.57	3.74	13.83		10.15	
<b>Sexual Risk (SHQ)</b>							
mean	50.06	52.47	48.88	47.13	63	49.63	.257
std dev	7.15	15.24	7.71	7.87		9.88	
<b>Reward Sensitivity (PAL Task)</b>							
<b>Psychological Outcomes</b>	1-25%	26-50%	51-75%	76-100%	n	Total	<i>p</i>
<b>Personal Safety</b>							
mean	51.55	49.31	50.80	48.17	66	49.96	.284
std dev	9.69	11.73	10.20	9.21		9.97	
<b>Violence risk</b>							
mean	46.95	51.15	51.47	51.72	66	50.32	.020
std dev	8.34	11.66	10.66	12.00		10.58	
<b>Alcohol Use</b>							
mean	51.75	49.08	51.07	47.94	66	49.96	.345
std dev	10.85	8.80	11.14	9.12		9.99	
<b>Nicotine Use</b>							
mean	49.90	48.62	48.93	52.33	66	49.95	.157
std dev	10.00	9.61	9.28	10.91		9.91	
<b>Drug Use</b>							
mean	50.05	50.31	52.27	47.44	66	50.02	.438
std dev	11.45	8.17	13.40	6.24		10.12	
<b>Sexual Risk (SHQ)</b>							
mean	47.6	53.69	47.93	51.5	66	50.18	.162
std dev	8.06	12.65	6.71	11.39		9.91	

*ADHD and Violence risk*

As noted above, the extent to which temporal discounting (RDT task) and reward sensitivity (PAL task) mediated the linkages between ADHD and violence risk was examined using bootstrapping of indirect effects via an SPSS macro developed by Preacher & Hayes (2008). In this procedure, the data were modelled with a single direct pathway between ADHD and violence risk, and two indirect pathways between ADHD and violence risk, the first via the temporal discounting variable, and the second via the reward sensitivity variable (see Figure 6 below). The results of these mediational analyses showed:

1. There was evidence of a statistically significant *direct* pathway from ADHD to violence risk ( $\beta = .20$ ,  $SE = .08$ ,  $p = .02$ ). Tests of the total mediating pathways via temporal discounting and via reward sensitivity was found to be statistically significant ( $\beta = .26$ ,  $SE = .08$ ,  $p = .001$ ). A test of the total *indirect* effect via both mediating factors was also found to be statistically significant (point estimate = .06,  $p < .05$ , 95% CI [.01, .14]). A test of the specific indirect effects of each mediator was found to be significant for reward sensitivity (point estimate = .06,  $p < .05$ , 95% CI [.01, .04]) but not temporal discounting (point estimate = .21,  $p = n.s$ ).

**Figure 6. Mediation model showing the single direct pathway between ADHD and violence risk (a), and two indirect pathways between ADHD and violence risk, the first via the temporal discounting variable (b), the second via the reward sensitivity variable (c). The total indirect effect via both mediating factors is also shown (d).**



**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant ( $p < .05$ ), \*\* = highly significant ( $p < .01$ ), m = marginally significant

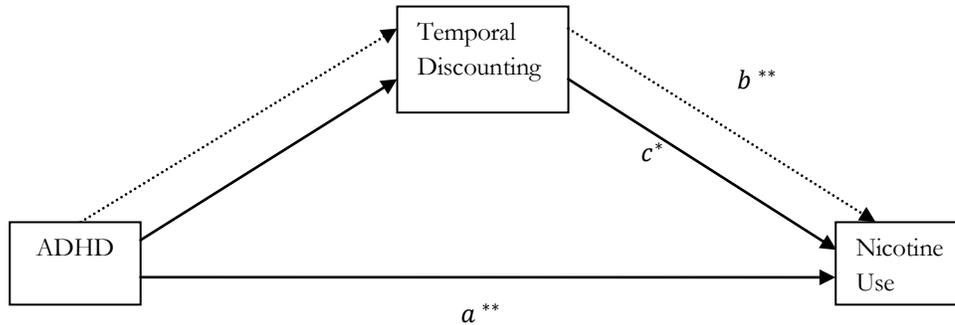
The results of these analyses suggest that the linkages between ADHD and violence risk were mediated by reward sensitivity, but not by temporal discounting. Those individuals with higher ADHD scores were at greater risk of violence (perpetration or victimisation), and this risk could be largely explained by a greater sensitivity to reward, and a lower sensitivity to punishment amongst those with higher ADHD scores.

*ADHD and Nicotine Use*

In the second procedure, the extent to which temporal discounting (RDT task) mediated the linkages between ADHD and nicotine use was also examined using bootstrapping of indirect effects via an SPSS macro (Preacher & Hayes, 2008). In this procedure, the data were modelled with a single direct pathway between ADHD and nicotine use, and a single indirect pathway between ADHD and nicotine use, via the temporal discounting variable (see Figure 7). The results of these mediational analyses showed:

2. There were evidence of a statistically significant *direct* pathway from ADHD to Nicotine use ( $\beta = .20$ ,  $SE = .07$ ,  $p = .008$ ). A test of the total mediating pathways via temporal discounting was found to be statistically significant ( $\beta = .23$ ,  $SE = .07$ ,  $p = .002$ ). A test of the total *indirect* effect via the mediating factor was also found to be statistically significant (point estimate = .04,  $p < .05$ , 95% CI [.006, .09]).

**Figure 7. Mediation model showing the single direct pathway between ADHD and nicotine use (a), the total pathway between ADHD and nicotine use, and a single indirect pathway between ADHD and nicotine use, via the temporal discounting variable (c).**



**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant ( $p < .05$ ), \*\* = highly significant ( $p < .01$ ), m = marginally significant

The results of these analyses suggest that the linkages between ADHD and nicotine use were mediated by temporal discounting (reward sensitivity was not significantly related to this outcome variable). Those individuals with higher ADHD scores were at greater risk of nicotine use in adulthood, and this risk could be largely explained by a greater tendency to ignore longer term rewards (or negative consequences) in order to reap shorter term gains (temporal discounting), amongst those with higher ADHD scores.

In summary, the mediational models above demonstrate that adults with higher levels of ADHD symptomatology are at a greater risk of a range of risk-taking behaviours, including violence perpetration and victimisation, nicotine,

alcohol and drug use, and sexual risk taking. Furthermore, for at least two behaviours (violence risk and nicotine use) a significant amount of this increased risk may be differentially explained by either a higher rate of temporal discounting or variances in reward and punishment sensitivity; motivational variances that are found to be significantly associated with ADHD in adulthood.

*Phase III: Psychological Outcomes Associated with ADHD and Comorbid*

*Childhood Abuse Victimization:*

*Bivariate Associations:* Item by Item analysis of group-difference responses on the CTQ (Childhood Trauma Questionnaire: Bernstein & Fink, 1998) are reported in Table 7. Bivariate associations between ADHD and psychological outcomes and between child abuse victimisation and psychological outcomes are reported in Tables 8 and 9. Significant associations were found between ADHD and a number of negative psychosocial outcomes (see Table 6 for more detail) using logistic regression, including higher life-time rates of mood disorders ( $\beta=.05, p=.012$ ), alcohol abuse disorders ( $\beta=.07, p=.002$ ), and drug abuse disorders ( $\beta=.06, p=.013$ ). Rates of anxiety disorders were not significantly associated with ADHD. These associations indicate that those adults with ADHD were significantly more likely to have experienced significant mental health problems, including low mood (69%), drug (34%) and alcohol abuse disorders (46%) over the lifecourse. These rates contrast with those experienced by participants in the controls (35% mood, 10% drug, 19% alcohol, disorders respectively). In addition, significant associations were found using Spearman's Rank Order correlations, between ADHD and emotional abuse ( $r_s(64) = .37, p = .002$ ), and physical abuse ( $r_s(64) = .32, p = .009$ ), indicating that adults with ADHD were more likely to have experienced emotional abuse and physical abuse in childhood. In turn, emotional abuse victimisation was

significantly associated with rates of mood disorders across the lifespan ( $\beta=.21$ ,  $p=.009$ ), but was not significantly associated with rates of anxiety disorders, alcohol abuse disorders, or drug abuse disorders (all *n.s.*). Other types of child abuse (physical or sexual abuse, emotional or physical neglect) were not found to be significantly associated with ADHD.

**Table 7: Childhood Trauma Responses by group**

Item from CTQ	Female Controls (n=11)	Male Controls (n=20)	Females with ADHD (n=12)	Males with ADHD (n=23)	Test Statistics
<b>I didn't have enough to eat when I was growing up</b>	27	25	8	22	$\chi^2(3, N=66)= 4.96$ $p= 0.03$
<b>My parents were too drunk or high to take care of the family</b>	0	10	17	9	$\chi^2(3, N=66)= 9.90^*$ $p= 0.00$
<b>My parents wished I had never been born</b>	36	15	50	48	$\chi^2(3, N=66)= 5.26$ $p= 0.02$
<b>People hit me so hard they left bruises</b>	18	35	50	39	$\chi^2(3, N=66)= 6.57$ $p= 0.01$
<b>I believe that I was physically abused</b>	9	20	42	30	$\chi^2(3, N=66)= 6.16$ $p= 0.01$
<b>I had the perfect childhood</b>	91	70	50	78	$\chi^2(3, N=66)= 8.7$ $p= 0.00$
<b>I got hit or beaten so badly that it was noticed by someone like a teacher, neighbour or doctor.</b>	0	5	17	9	$\chi^2(3, N=66)= 4.84^*$ $p= 0.03$
<b>I felt that someone in my family hated me</b>	9	15	75	43	$\chi^2(3, N=66)= 5.61$ $p= 0.02$
<b>Someone touched me in a sexual way or tried to make me touch them</b>	36	10	17	17	$\chi^2(3, N=66)= 6.98$ $p= 0.00$
<b>Someone threatened to hurt me or tell lies about me unless I did something sexual with them</b>	0	10	8	4	$\chi^2(3, N=66)= 7.79^*$ $p= 0.00$
<b>I believe that I was sexually abused</b>	18	10	8	17	$\chi^2(3, N=66)= 5.51$ $p= 0.01$
<b>Moderate to severe</b>					
<b>Emotional abuse</b>	55	25	67	57	$\chi^2(3, N=66)= 4.38$ $p= 0.03$
<b>Sexual abuse</b>	27	10	17	22	$\chi^2(3, N=66)= 6.73$ $p= 0.00$
<b>Physical Neglect</b>	27	10	17	26	$\chi^2(3, N=66)= 8.98$ $p= 0.00$

*Note: Unless otherwise noted, all figures are presented as percentages. CTQ = Childhood Trauma Questionnaire. \* = Yate's correction for chi-square employed*

**Table 8. Bivariate Associations between ADHD and Psychological Outcome Variables**

Psychological Outcomes	ADHD Severity Quartiles				Total	p
	1-25%	26-50%	51-75%	76-100%		
<b>Mood Disorders</b>						
n	5	7	11	14	37	0.012
%	13.51	18.92	29.73	37.84		
<b>Anxiety Disorders</b>						
n	4	5	8	8	25	<i>n.s</i>
%	16.00	20.00	32.00	32.00		
<b>Alcohol Abuse Disorders</b>						
n	2	4	5	11	22	0.002
%	9.09	18.18	22.73	50.00		
<b>Drug Abuse Disorders</b>						
n	1	3	2	9	15	0.013
%	6.67	20.00	13.33	60.00		

**Table 9. Bivariate Associations between Moderator and Outcome Variables**

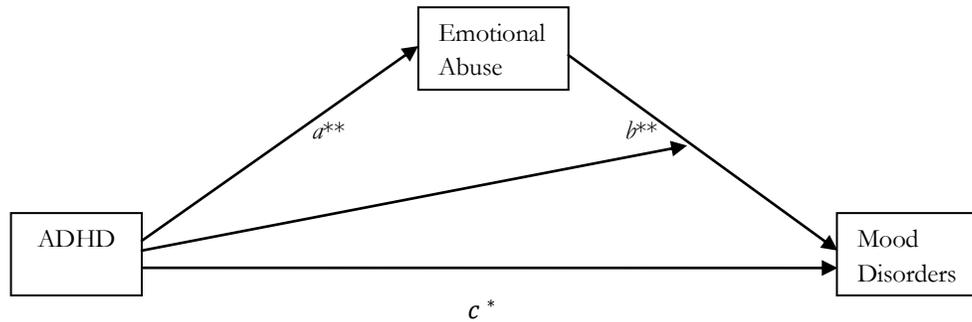
Psychological Outcomes	Moderating Variables				Total	p
	Emotional Abuse Severity Quartiles					
	1-25%	26-50%	51-75%	76-100%		
<b>Mood Disorders</b>						
n	6	7	11	13	37	0.009
%	16.22	18.92	29.73	35.14		
<b>Anxiety Disorders</b>						
n	3	5	10	7	25	<i>n.s</i>
%	12.00	20.00	40.00	28.00		
<b>Alcohol Abuse Disorders</b>						
n	6	4	5	7	22	<i>n.s</i>
%	27.27	18.18	22.73	31.82		
<b>Drug Abuse Disorders</b>						
n	2	3	4	6	15	<i>n.s</i>
%	13.33	20.00	26.67	40.00		

### *ADHD and Emotional Abuse Outcomes*

As noted above, the extent to which emotional abuse victimisation moderated the linkages between ADHD and mood disorder history (mood) was examined using bootstrapping of indirect effects via ordinary least squares moderated mediation (Preacher & Hayes, 2008). In this procedure, the data were modelled with a single direct pathway between ADHD and mood, and an indirect pathway between ADHD and mood via the emotional abuse measure (see Figure 8). The results of this modelling showed:

3. There were statistically significant pathways between ADHD and emotional abuse ( $\beta=.12$ ,  $SE = .36$ ,  $p =.002$ ), and statistically significant pathways to mood disorder outcomes from emotional abuse ( $\beta = .21$ ,  $SE = .08$ ,  $p < .009$ ). There was evidence of a statistically significant *direct* pathway from ADHD to mood disorders outcomes ( $\beta = .05$ ,  $SE = .02$ ,  $p =.012$ ).
4. Overall tests of the moderating pathways via emotional abuse victimisation (total effect) were found to be statistically significant ( $\beta =.64$ ,  $SE =.19$ ,  $p =.001$ ). A test of the total indirect effect via the moderating factor of emotional abuse was also found to be statistically significant ( $\beta =.03$ ,  $SE = .01$ ,  $p =.048$ ).

**Figure 8: Moderated mediation model showing the single direct pathway between ADHD and mood disorders (c), a single indirect pathway between ADHD and mood disorders, via the childhood emotional abuse variable (ab), and the moderating effect of ADHD on the ‘b’ path.**



**Notes:** p-values use a modified Michelin scale by adding marginal significance: \* =significant (p<.05), \*\*= highly significant (p<.01), m= marginally significant

The results of these analyses suggest that the linkages between ADHD and mood disorder rates across the lifespan were moderated by the experience of emotional abuse in childhood. Those individuals with higher ADHD scores were at greater risk of experiencing emotional abuse as children. The interaction of these factors (ADHD+ childhood emotional abuse) contributes to a greater risk of mood disorders later in childhood and/or adulthood in these individuals. This finding indicates that early experiences of child abuse among individuals with ADHD may lead to a greater burden of mental health disorder comorbidity in adulthood.

*Phase IV- Adult ADHD and Physical Health Outcomes:*

*Bivariate Associations:* Bivariate associations between ADHD and physical health outcomes are presented in Table 10 (below). In summary there were no significant associations between any of the outcomes measured (general health status; exercise; obesity, chronic illness & injuries, and eating and food habits). In addition, significant associations were not found between these physical health outcomes and psychosocial mediators (such as social support, stress levels) and between these mediators and ADHD.

**Table 10. Bivariate Associations between ADHD and Physical Health Outcomes**

Grouping Variable						
Physical health Outcomes	ADHD	Control	n	Total	p	
<b>Dental health Rating</b>						
mean	1.5	1.43	64	1.47	0.22	
std dev	0.75	0.73		0.73		
<b>Previous sick days (in month)</b>						
mean	5.09	4.47	65	4.8	0.278	
std dev	8.53	7.85		8.16		
<b>Total exercise per week (sessions)</b>						
mean	7.91	8.8	65	8.32	0.196	
std dev	6.85	5.54		6.25		
<b>Time spent sitting (weekday) (hours)</b>						
mean	7.26	7.54	60	7.38	0.804	
std dev	4.09	2.94		3.61		
<b>Time spent sitting (weekend day) (hours)</b>						
mean	6.15	5.5	60	5.87	0.164	
std dev	3.88	2.83		3.45		
<b>body weight (BMI)</b>						
mean	23.09	25.2	65	24.06	0.956	
std dev	11.26	4.25		8.76		
<b>Frequency of Eating Fried Food (per week)</b>						
mean	1.74	1.93	65	1.83	0.622	
std dev	0.92	0.91		0.91		
<b>Dysfunctional Eating (EAT total scores)</b>						
mean	191	193	65	192	0.145	
std dev	17.65	17.4		17.43		
<b>Health Check within 3 years</b>						
n	21	19	65		0.40	
%	60	63.33				
<b>Diet Awareness (read food labels)</b>						
n	23	21	65		0.286	
%	65.71	70				
<b>Take nutritional supplements</b>						
n	25	19	65		0.982	
%	71.43	63.33				
<b>Injury Interfering With Life</b>						
n	18	10	65		0.128	
%	51.43	33.33				
<b>Long Term Illness or Disability</b>						
n	10	5	65		0.065	
%	28.57	16.67				

## DISCUSSION

### 4.1 Summary of Empirical Findings

#### *Phase I: Adult ADHD and Self-destructive Behaviours:*

Self-destructive behaviours among adults with ADHD is of interest because a number of studies have found an association between ADHD and the risk factors of suicide and self-harm behaviours (Hesslinger et al., 2003). In addition, ADHD symptomatology that persists into adulthood is associated with a number of other high-risk behaviours (Barkley & Gordon, 2002). The limited research that has so far highlighted an association between ADHD and self-destructive behaviours, has generally related to children/ youth (Chronis-Tuscano et al., 2010) rather than adults; or has been a result of psychiatric post-mortem (James et al., 2004), rather than direct assessments with living participants. In this study, a possible association between ADHD and self-harm and suicide was directly investigated. ADHD symptomatology severity in *adulthood* was found to be significantly and indirectly associated with life-time histories of self-harm (self-injurious behaviour performed without the intention of ending one's own life); recurrent suicidal ideation (thoughts of ending one's life); and previous occurrences of suicidal attempts (act performed

with the intention to end one's life with some belief in the lethality of the method used). It was found that life-time psychiatric comorbidity (mood, anxiety, and substance abuse disorders) significantly mediated the relationship between ADHD and all three self-destructive behaviours. This finding was consistent with previous studies that have found psychopathology to be a primary risk factor of suicide (Cavanagh et al., 2003) and self-harm (Nock et al., 2006).

In addition to psychiatric comorbidity, emotion-focussed coping style was found to be a significant mediator between ADHD and self-harm and suicidal ideation (but not suicidal attempts). Emotion-focussed coping style reflects trait-like tendencies in response to stressful or upsetting events, as measured by Endler and Parker's Coping Inventory for Stressful Situations (CISS; 1990). Individuals who score highly on the Emotion-Oriented Coping style Index are more likely to resort to emotional responses (such as blaming); preoccupation with their feelings, and increased self-focus; all responses which may inadvertently increase distress (Endler & Parker, 1999). Consistent with the results from this study, Endler and Parker (1994) and Billings and Moos (1984) found an association between emotion-focussed coping styles with higher levels of psychopathology, above any association with other styles of coping. There is the possibility that for parasuicidal behaviour (self-harm and suicidal ideation), comorbid psychopathology and emotion-focussed coping may act as two-step mediators of an association with ADHD. In other words,

emotion-focused coping may mediate the role between psychopathology and parasuicidal behaviour. Such a model has some support in the literature. For example, based on their research, Nock et al., (2008) suggested that increased emotional reactivity may mediate the relationship between psychopathology and self-harm behaviours. Exploring such a two-step model of mediation was unfortunately beyond the limits of the current study; but may be worth follow-up in the future, given the explanatory coherence it may provide in the relationship between ADHD and parasuicidal behaviours.

The lack of a significant association between emotion-focussed coping style and suicidal attempts in this study was not consistent with a study by Edwards and Holden (2001) who found that emotional coping style (as measured by the CISS) predicted suicidal attempts in both women and men. The researchers, however, did not clearly differentiate between self-harm (without intention of dying) and suicidal behaviours (with the intention to die). Other studies on coping styles and suicidal attempts (e.g. Mandal & Zalewska, 2010) similarly do not clearly differentiate between suicidal and parasuicidal behaviours, making comparisons with the current study problematic. Therefore, it is difficult to draw conclusions as to the possible reasons why emotion-focussed coping does not mediate suicide attempts in this study. It may be because of a lack of consistency with the research design of other studies, as mentioned above; it may simply be due to inadequate

power levels due to the smaller sample in this study; or it may be due to some particular facet of ADHD that differentiates their pathway to suicide.

This last hypothesis certainly has merit as a number of studies have found an association between suicide attempts and personality traits that are consistent with, and in fact, characteristic of, ADHD. For example, in a psychological post-mortem, Brent et al., (1994); found that individuals who committed suicide scored higher on personality traits such as impulsivity and aggression, even after controlling for comorbid psychopathology. In addition, in longitudinal research in New Zealand, novelty seeking was found to be a personality predictor of suicide in young people (Fergusson, Woodward & Horwood, 2000). Brezo et al., (2005) similarly found impulsivity to be associated with suicide attempts in a sample of Canadian young people. Therefore, the most significant mediator of suicidal attempts among adults with ADHD may prove to be impulsivity or some other facet of disinhibition inherent in ADHD. Again, this was not addressed in this study (and is a limitation of this study), due to the small sample, but is certainly an area of ADHD research warranting further investigation. Such a detailed exploration of the mediation pathway between ADHD and attempted suicide may also provide a valid contribution to our understanding of the pathway between suicide and other forms of psychopathology, particularly those that involve a dimension of impulsivity.

*Phase II: Motivational Variances and Risk Taking in Adult ADHD:*

Given the documented associations between ADHD in adulthood and high-risk behaviours such as dangerous driving (Murphy & Barkley, 1996; Woodward, Fergusson & Horwood, 2000), substance abuse (Biederman et al., 2006), and sexual risk taking behaviour (Woodward, 1999; Barkley, 2002), understanding the behavioural drivers of these associations may assist in reducing the risk of disability and mortality in this population. Furthermore, a seemingly overlooked area of risk in ADHD (risk of violence) has not been extensively explored in non-offending populations with ADHD, despite indicators that both perpetration and victimization of violence may be associated with childhood ADHD (Goodman et al., 2008) and impulsivity in adults with ADHD (Dowson and Blackwell, 2010). If adults with ADHD are found to be at greater risk of accidental or deliberate harm, safety intervention strategies may be an important adjunct in psychological treatments for ADHD.

In this study, ADHD in adulthood was found to be significantly associated with risk-taking variables including violence risk (both perpetration and victimisation); risk of alcohol abuse, nicotine abuse, illicit drug abuse and sexual risk-taking (including number of partners, casual sex encounters, sexually transmitted diseases). Risk-taking measures associated with personal safety

indicators (such as seatbelt use, safety helmet use, dangerous driving) were not found to be significantly associated with ADHD in adulthood.

The findings concerning substance abuse were consistent with a number of studies that repeatedly found an association between ADHD in adulthood and drug and alcohol abuse (e.g. Biederman et al., 2006; Barkley, 2008). The significant association between ADHD and sexual risk taking was also consistent with previous findings (e.g. Woodward, 1999; Barkley, 2002). In addition, the findings regarding risk of violence perpetration (adults with ADHD were more likely to self-report more frequent engagement in physical fights and carrying a weapon to social encounters) were consistent with both nonspecific findings regarding the association between ADHD-consistent traits such as impulsivity and fighting (Stanford et al.; 1996) in addition to specific findings regarding ADHD and impulsive aggressive behaviours (Dowson and Blackwell, 2009). In addition, adults in this study reported significantly higher occurrences of victimisation of violence, including sexual violence (“have you ever been physically forced to have sex?”) and domestic violence (“has a spouse or partner ever physically hurt you on purpose?”). These findings are consistent with research that point to an association between childhood physical and sexual abuse victimisation and ADHD (Ford et al., 2000; Briscoe-Smith & Hinshaw, 2006; Rucklidge et al.; 2006), but as mentioned earlier, there is a paucity of research on adults with ADHD and their risk of experiencing violent or

sexual assaults in adulthood. The results from this study do indicate that adults with ADHD may prove to be vulnerable to risk of harm from others. Without apportioning blame on the victims of violence, it is important to explore possible mediators of the relationship between victimisation and ADHD. If there are traits or behavioural tendencies inherent in ADHD that make individuals less aware of danger or negative consequences, this knowledge may have a bearing on the development of self-protective strategies for such individuals. As such, in this current study, the indices of victimisation were grouped together with indices of the ‘perpetration’ of risk, such as drug and alcohol use; it is theorized that the mechanisms that underlie the path between ADHD and a variety of risk factors may be comparable. This study involved the exploration of two such potential mechanisms; reward sensitivity and temporal discounting. Unsurprisingly, both factors in this study were found to be significantly associated with ADHD in adulthood, results that were comparable with a number of findings regarding an association between ADHD and motivational differences (e.g. Tripp & Wickens, 2009; Sonuga-Barke et al., 2003). Given the likely functional overlap between reward/ punishment sensitivity and temporal discounting, these variables were explored both as single direct mediators as well as combined mediators of the risk-taking outcomes mentioned above. The findings from this study suggest that reward sensitivity and temporal discounting may have a differential effect on risk-taking

behaviours. Whilst reward sensitivity significantly mediated the relationship between ADHD and violence risk, temporal discounting was found to significantly mediate the relationship between ADHD and nicotine use. This differential effect of the two motivational variables is logical. One of the key differences between the reward sensitivity and temporal discounting paradigms is the tangibility of the contingent reward. While the positive and negative reinforcement involved in the reward sensitivity variable were real and tangible (as measured by the Passive Avoidance Learning task, [PAL; Farmer and Rucklidge, 2006]), the reinforcement was hypothetical in the temporal discounting variable (as measured by the Reward Discounting task (RDT; Barkley et al., 2001)). These differences in tangibility seem to be consistent with any 'real-life' reinforcement involved with violence risk (more immediate/ tangible) versus nicotine use (more hypothetical/ delayed risk). This is supported by the findings of Scheres and Sumiya (2007) regarding the differential effect of tangibility on reinforcement.

Alternatively, the differential findings regarding the impact of reward sensitivity/ temporal discounting mechanisms, may have highlighted a potential difference between two neurocognitive 'subtypes' of ADHD, one that is characterised by a greater tendency to discount delayed rewards and another subtype that is less sensitive to punishment and more sensitive to reward. This hypothesis relating to the findings in this study are consistent with the subtypes of ADHD

posited by Sonuga-Barke et al., (2002) and Winstanley et al., (2006): in which ADHD symptoms are influenced by two related but distinct behavioural pathways, delay aversion and behavioural disinhibition:

“...the altered ‘motivational style’ pathway (MSP ADHD) which generates a strong aversion to experiencing delays” and the “disordered thought and action” pathway (DTAP ADHD) which results in a more fundamental dysregulation of inhibitory function” (Winstanley et al., 2006 p.382).

Such a distinction between the differential effects of delay aversion and disinhibition/ insensitivity to punishment, may be important in understanding the effects of different neural variances on ADHD (Sonuga-Barke, 2002) and in turn, the effect of ADHD on adult risk-taking outcomes.

In this study, the nonsignificant association between ADHD and personal safety measures (e.g. such as seatbelt and helmet use) were not consistent with research of Barkley (2008) or Jonah et al., (2001) but again, this was an area of exploration. As there is a dearth of research that explores such behaviours in adults ADHD; it may be that such an association between adult ADHD and such behaviours does not exist. Conversely, the nonsignificant association between ADHD and safety behaviours may be due to a possible limitation of this study, such as the smaller sample size. Conversely, the majority of the studies that have found

an association between ADHD and lower rates of self-protective behaviours have been completed with younger samples (Jonah et al., 2001), whereas the average age of this study was 35 year of age (compared with an average of 25[Jonah et al., 2001]). Given the association between age and risk-taking behaviours in general (Laurence, 2008), the older age range of this study may have negated any potential association between ADHD and these risk outcomes.

In addition, a possible limitation of this phase of the study is the measure on which the dependent risk-taking variables are based, the ART-Q. As this is a new measure with as yet, only preliminary demonstrated levels of reliability and validity, the measure may not have been sensitive enough to gauge all possible effects of associations between ADHD and risk-taking outcomes. The reliance on such a new measure demonstrates the lack of a selection of reliable measures of adult risk-taking that were available at the time that this study was conducted. Since this study was completed, a number of promising measures have been found which specifically assess susceptibility to risk taking, such as the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia et al., 2001), which was validated for use with children with ADHD by Luman and colleagues (2012). In hindsight, such measures would have been helpful additions to the measurement of risk taking in this study.

A further limitation of this phase of the study is the reliance on the grouped variable of 'violence risk'. This grouping (of perpetration and victimisation) was employed for greater statistical power (too many intervening variables would have resulted in a significant loss of power) and also for logical reasons (almost all of the participants involved in relationship violence were both perpetrators and victims). However, such a grouping of 'victims' and 'perpetrators' of violence while methodologically sound, was ethically more difficult to rationalize. In future research (ideally with ideally larger sample sizes) it is hoped that clearer distinctions would be made between victimisation and perpetration of violence.

Furthermore, although discussion of possible neurocognitive subtypes is of interest, a limitation of this study is the small number of experimental tasks that were used to represent delay aversion and behavioural inhibition. Further exploration of the responses of adults with ADHD to a number of such tasks (such as the stop signal, Go/no-go tasks) may provide more in-depth findings regarding any possible neurocognitive subtype differentiation.

*Phase III: Psychological Outcomes Associated with ADHD and Comorbid**Childhood Abuse Victimization:*

Negative outcomes in adulthood associated with abuse and neglect in childhood have been well documented (e.g. MacMillan et al., 2001; Neigh et al., 2009). In addition, there is growing evidence of increased rates of psychological comorbidity in individuals with ADHD (E.g. Hesslinger et al., 2003; Biederman, 2006) and some evidence that individuals with ADHD are at a greater risk of experiencing abuse in childhood (Pianta et al., 1989). In recent research, Ouyang et al., (2008) found that children with ADHD were at greater risk of neglect, physical abuse and sexual abuse, and that the ADHD subtypes conferred differential risk. However, the authors did not appear to include any forms of emotional abuse or emotional neglect measures in their research (this was directly addressed in the present study). Given these associations between ADHD and early child abuse, child abuse and adverse outcomes, and ADHD and latter psychopathology; it is logical that ADHD, combined with some kind of early developmental adversity may have an additive effect on psychological outcomes in adulthood.

In the current study, child abuse and neglect were retrospectively assessed in a sample of 35 adults with ADHD and a matched control group of 31 adults, using the Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998).

Childhood emotional abuse and physical abuse were found to be significantly associated with ADHD symptomatology. These findings were consistent with those of Ouyang et al., (2008) except this study did not uncover an association between child sexual abuse and ADHD. However, this could well be a product of the contrast in sample size between this study (n=66) and that of Ouyang et al., (n=14,322). In the study reported here, path analyses were completed to explore the relationship between ADHD and early abuse experience. It was found that early child abuse experience had a moderating influence on the likelihood of the latter development of mood disorders in adulthood.

The findings of this study were consistent with the expectations of Mulsow et al., (2001) who proposed that ADHD may confer additional risk in regards to early exposure to child abuse and maltreatment, citing the increased rates of family stress and conflict among families with ADHD (Mulsow et al., 2001). The role of family stress and conflict as potential mechanisms of increased rates of emotional abuse among individuals with ADHD is persuasive. For example, conflict and parental difficulties seem to be particularly problematic when ADHD in the child is combined with parental ADHD (E.g. Sonuga-Barke et al., 2002; Harvey et al., 2003) although some (e.g. Biederman et al., 2002; Psychogiou et al., 2008) have reported the reverse; that a match between parent-child ADHD status can ameliorate parenting difficulties that are usually associated with ADHD. Regardless of the

goodness of fit between parent-child ADHD status; overall family stress tends to be increased and parent quality of life reduced, when parenting a child with ADHD (Brown & Pacinin, 1989; Coghill et al., 2008). Increased family stress associated with parenting a child with ADHD is in turn, associated with increased parental substance abuse and depression (Cunningham et al., 1988; Brown et al., 1989). In addition, if intergenerational ADHD exists in a family, there may be an increased risk of deprivation and poverty, due to poorer financial management and employment/ earning capacity (Barkley et al, 2008), and parental psychopathology (Hesslinger et al., 2003) among parents with ADHD; all of which are well-known risk factors for family conflict and child abuse (De Bellis et al., 2001; Mulsow et al., 2001).

A key limitation of this study was the difficulty in assessing the intergenerational effects of ADHD. Very few adults in the parents' generation had ever been assessed for ADHD in New Zealand. In addition, participants' perception of their parents ADHD status may be very subjective and therefore not very reliable. Therefore, in this study, we were unable to explore a possible differential association between emotional abuse rates of individuals with ADHD; whose parents did or did not have ADHD as referred to by Sonuga-Barke et al., (2002) and Harvey et al., (2003).

An additional limitation specific to this study is the reliance on the retrospective self-report of childhood trauma and abuse. Although the measure utilised (CTQ: Bernstein & Fink, 1998) has been well validated (Paivio & Cramer 2004), the retrospective report of such childhood events in adulthood is notoriously low in reliability (e.g. Fergusson et al., 2000).

*Phase IV- Adult ADHD and Physical Health Outcomes:*

The extent to which adults with ADHD engage in health-risk behaviours has a direct bearing on the risk of this population of major causes of death in Western nations: cardio- and cerebrovascular diseases, cancer, accidents, lung and liver diseases, diabetes and infectious diseases (Stroebe, 2000). Some indications have been found to suggest an association between adult ADHD and sleep problems, compromised medical and dental self-care, and some indications of an increased heart disease risk (Barkley, 2008). However, many other health issues such as poor nutrition, mobility, disability, exercise and poor health knowledge (e.g. risks of high cholesterol diets) had not yet been fully addressed. In this study, there were no significant associations found between ADHD and the key health indicators assessed (general health status; exercise; obesity, dental health, chronic illness & injuries, and eating and food habits). These results are somewhat inconsistent with the findings of Barkley et al., (2008) and Cortese and Morcillo Penalver (2010), which detailed associations between ADHD and poor health indicators such as hypertension and obesity. However, this current study involved only a brief survey of health outcomes, compared with the more in-depth testing conducted as part of the Milwaukee and UMASS (University of Massachusetts Medical School) longitudinal studies (Barkley et al., 2008). A possible reason for the nonsignificant findings regarding ADHD and physical health, may relate to a fundamental

limitation associated with this study; namely the measure chosen to assess physical health status. The SLÁN Health and Lifestyle Questionnaire (Survey of Attitudes Lifestyle and Nutrition; Kelleher et al., 2003) was developed and used by the Republic of Ireland in a national health screening study in 2002. At the time of the commencement of the current study, the 2002 SLÁN version was the most current. More recent versions of the SLÁN (e.g. 2007) have been significantly modified to increase reliability and validity of the measure. Alternatively, the method of measurement may have been problematic in this study: self-report of physical health makers may not have been a reliable measure for a population of adults with attentional difficulties. This is supported by the fact that many of the participants were unaware of their levels of blood pressure or blood cholesterol levels.

#### 4.2 General limitations

The limitations of this study may largely be related to the small sample size. This was partly a product of the small population pool of resident adults with ADHD from which this sample was selected. It was also due to the difficulty in accessing this very diffuse population of adults with ADHD. At the time of the commencement of this research, there were no specific centres available in Christchurch, New Zealand for the assessment and/or treatment of adults with ADHD. In fact, many of the participants who were referred to this study from public health services were referred due to a lack of service available for ADHD. As a result of the difficulties in accessing a sample from a diffuse and already limited population (Christchurch has a resident population of less than 500, 000), only 35 adults with confirmed diagnoses of ADHD were able to be recruited and retained, over a 24 month period. As a result, whilst power levels were adequate for two-step mediation models in each of the studies reported, more in-depth exploration was not possible without increasing type II error levels significantly.

A further limitation of this study was the retrospective design of the data that was utilized to assess both ADHD symptomatology and the dependent variables of self-destructive behaviours. An ideal research design would involve the longitudinal follow-up of individuals with ADHD. This follow-up would ideally extend past age 30, as many individuals with ADHD who attempt suicide do so at an

older age (James et al., 2004) and some of the risk-taking outcomes measured (such as domestic violence) may be associated with an older age group. However, such a longitudinal design would be very difficult to achieve in new Zealand without a specific treatment centre that caters for, or even accepts adults with ADHD.

An additional limitation of this reported study is the reliance on self-reported data. Whilst ADHD diagnosis was conditional on corroborated information, many of the risk-taking outcomes, self-destructive behaviours and psychosocial variables were based on self-report in this study. Although this retrospective design was a necessity as a result of the time-limited and scope-limited nature of single-investigator research, these methodological limitations warrant caution regarding the reliability of this data.

A limitation relating to the participant pool may have resulted from the fact that a significant number of the participants in this study self-referred via public advertisements. For example, the wording of the public advertisement may have influenced highly suggestible people in suggesting that they might have ADHD. This may have led to sample characteristics such as higher health awareness or neurosis that may have skewed the results in a particular direction. For example, the lack of significant results in the health status between adults with ADHD and controls may be partly attributable to high levels of health awareness among the ADHD group which may have obscured any real differences in obesity or indicators

of poorer physical health such as high blood pressure or cholesterol. Indeed, high health awareness has been found to be correlated with better health status in the general population (e.g. Lip et al., 1996).

Finally, both groups in this research were found to achieve higher than average intellectual functioning scores, as measured by the WASI (mean FSIQ for both groups= 120). This may be due to some selection bias, or more likely, due to over-estimation of IQ by administration of the WASI of which there is some evidence (Axelrod, 2002). However, if the WASI scores were in fact, inflated in the sample in this study, this would have been equally likely to affect both the ADHD and control groups in this study. Therefore, the consistency of intellectual functioning between the groups was unlikely to have been affected.

### 4.3 General Summary

In conclusion, this was an exploratory research project into the association between ADHD symptomatology in adulthood and risk-taking and psychosocial outcomes in a New Zealand sample. Significant associations were found between ADHD and self-destructive behaviours including self-harm, suicidal ideation and suicidal attempts, which were reported at disturbingly high levels. These associations were mediated by comorbid psychopathology and emotion focused coping. The importance of exploring the functional pathways to these risky behaviours cannot be understated. These findings not only help to elucidate the risks associated with the persistence of ADHD into adulthood, but also provide a valid model for potential intervention into suicide and self-harm prevention among adults with impulsive or disinhibited traits.

Significant associations were also found between adult ADHD and risk-taking outcomes that measured risk of both the perpetration and victimisation of violent behaviours. These findings illustrate that ADHD symptomatology may contribute an additional element of risk in adulthood that has received very little attention to-date, as rates of domestic or sexual violence among this population have not been extensively explored. Considering the worryingly high self-reported rate of intimate violence among participants with ADHD in this current study (46% compared with 23% among controls), this research highlights the importance of

considering the many domains in which the safety of adults with ADHD may be compromised, including the risk of harm from intimate partners.

In addition, this research helped to highlight the possible fundamental influence of ADHD on a range of other risk-taking behaviours in adulthood, including drug and alcohol abuse, nicotine use and sexual risk taking. The fact that some of these behaviours were differentially mediated by two motivational variances; reward sensitivity and temporal discounting; supports the hypothesis that individuals with ADHD may differentially respond to reinforcement (based on factors such as the tangibility of the reinforcement or the delay of the reward). This evidence of differential mediators further supports a dual neural pathway model of ADHD which may result in two phenotypes; characterised by either behavioural disinhibition (higher reward sensitivity, lower punishment sensitivity) or delay aversion (greater temporal discounting) (Sonuga-Barke et al., 2002).

*Clinical Implications*

The clinical implications of a dual pathway/ differential reward response, model of ADHD are manifold. Primarily, if clinicians have a better understanding of a more specific reinforcement model for subtypes of ADHD, then treatment can be better tailored for each individual. Similarly, this research has helped to elucidate the hypothesis that specific reinforcement models may operate for different behaviours. For example, whilst there appears to be an ongoing assumption that sensation seeking is characteristic of ADHD due to a generalized increased sensitivity to reward, it may be more accurate to suggest that a subset of individuals with ADHD are likely to engage in sensation seeking such as smoking, more because they have a greater difficulty with seeing the negative consequences of their actions through a kind of ‘temporal near-sightedness’ associated with temporal discounting (Barkley, 1998). The current research certainly supports this heterogeneous reinforcement model.

Therefore, within a clinical setting, to develop a behavioural treatment plan without catering for this differential response to reinforcement would likely lead to ineffective treatment. A very careful functional assessment would be imperative, including details on what drives each individual with ADHD (in regard to each problematic behaviour). This current research has further indicated that there may be a use for experimental models of reinforcement in assessing these very

behaviours for treatment. Furthermore, a differential reinforcement model may be helpful in the treatment of individuals without ADHD who may present with a range of impulsive behaviours, such as gambling, drug use or even self-harm behaviours within the context of 'pure' mood or personality disorders. A more specific, individually tailored investigation into the motivational drivers of harmful behaviours would be appropriate for any psychological disorder.

Reflecting the greater psychosocial costs associated with ADHD in adulthood, significant associations were also found in this research between ADHD and several comorbid psychological disorders (mood disorders, alcohol and drug use disorders). Given the persistent effects of ADHD symptomatology over the lifespan, additional predictors of later psychopathology were explored. Childhood emotional abuse was found to significantly moderate the pathway between ADHD and mood disorders in adulthood, suggesting that children and young people with ADHD, who are in an emotionally harmful family setting, may be a significantly more vulnerable group. Given the additional family and parental stress associated with ADHD (for both parent and/ or child with ADHD), the level of family functioning is an important area of exploration within the clinical setting. However, this is an area of enquiry that is often overlooked, perhaps partly due to the paucity of research into the functioning of families with ADHD. The research findings in this current study suggest a need for more targeted intervention with this subgroup of individuals with

ADHD, particularly within a family systems framework, as a preventative model for future compounding levels of psychopathology in adulthood.

Finally, this research study has highlighted the high degree of risk associated with adult ADHD. As this is a relatively new finding, few clinicians may be aware of the importance of a very thorough risk assessment with all individuals, but especially those with ADHD. Not only has this study demonstrated evidence of higher risks of suicidal ideation, these individuals are also at risk of ‘accidental’ mortality through overdose and fatal methods of self-harm. In addition, there are a number of ‘hidden’ risk behaviours such as low seatbelt use or unprotected sex which occur at a greater frequency among this population. As clinicians we may need to be even more thorough in our assessment of the myriad of ways in which this pervasive neurobehavioural disorder may influence an individual’s life.

*Conclusion*

In summary, the phases in this research project have illustrated a number of areas in which adults with ADHD are at greater risk of harm, both from themselves and from others. Adults with ADHD are at astoundingly higher risk of suicide; self-reporting rates of suicide attempts that are almost three times those of same-aged peers. Similarly, adults with ADHD have reported levels of domestic violence that are significantly higher than their peers. In addition, this research paints a picture of increased psychosocial risk factors that have the potential to develop into compounding mental health and risk-taking behaviours in adulthood, at much higher rates than those without ADHD. These outcomes include mood disorders, drug and alcohol abuse, violent altercations, sexual risk taking including low contraceptive use and increased rates of sexual attacks; many outcomes that may compound to increase the risk of suicidal intention and self-harm.

Furthermore, while these are previously under-researched topics, they are topics which are very significant, given the risks of injury and mortality that are potentially associated with self-destructive behaviours, violence risk and psychological comorbidities; not to mention the higher likelihood of psychological and existential distress associated with these outcomes. Whilst ADHD has previously been viewed as a disorder of childhood, or a relatively benign 'learning difficulty', fit for mention in the scholastic setting; this research has helped to clarify

the myriad of ways in which ADHD may be a potentially serious psychiatric disorder with compounding comorbidities and risk factors. As a result, ADHD in adulthood may need to be viewed in clinical settings with the same seriousness as other disorders of risk and impulsivity, such as borderline personality disorder or bipolar disorder, with systemic treatments that encompass the management and reduction of risk, alongside the alleviation of ADHD symptoms.

## BIBLIOGRAPHY

- Aberson, B., Shure, M. B., & Goldstein, S. (2007). Social problem-solving intervention can help children with ADHD. *Journal of Attention Disorders, 11*(1), 4-7.
- Abikoff, H., Hechtman, L., Klein, R. G., Weiss, G., Fleiss, K., Etcovitch, J., et al. (2004). Symptomatic improvement in children with ADHD treated with long-term methylphenidate and multimodal psychosocial treatment. *Journal of the American Academy of Child & Adolescent Psychiatry, 43* (7), 802-811.
- Action, A. O. (2002). Practice parameter for the use of stimulant medications in the treatment of children, adolescents, and adults. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*(supl 2), 26s-49s.
- Adler, L. A., Kunz, M., Chua, H. C., Rotrosen, J., & Resnick, S. G. (2004). Attention-Deficit/Hyperactivity Disorder in adult patients with Posttraumatic stress disorder (PTSD): Is ADHD a vulnerability factor? *Journal of Attention Disorders, 8*(1), 11-16.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Michigan: Prentice-Hall.
- Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin, 127*(1), 142-161.
- American Psychiatric Association. Task Force on DSM-IV.49 (2000). *Diagnostic and Statistical Manual of Mental Disorders: DSM-IV-TR* (4th ed.). Washington, DC: American Psychiatric Association.

- Aniol, J. C., & Snyder, D. K. (1997). Differential Assessment of Financial and Relationship Distress: Implications for Couples Therapy. *Journal of Marital and Family Therapy, 23*(3), 347-352.
- Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological Assessment, 10*(2), 176-181.
- Axelrod, B. N. (2002). Validity of the Wechsler Abbreviated Scale of Intelligence and Other Very Short Forms of Estimating Intellectual Functioning. *Assessment, 9*(1), 17-23.
- Barkley, R. A., Edwards, G., Laneri, M., Fletcher, K., & Metevia, L. (2001). Executive Functioning, Temporal Discounting, and Sense of Time in Adolescents with Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD). *Journal of Abnormal Child Psychology, 29*(6), 541-556.
- Barkley, R. A., & Gordon, M. (2002). Research on comorbidity, adaptive functioning, and cognitive impairments in adults with ADHD: Implications for a clinical practice. In S. Goldstein & A. T. Ellison (Eds.), *Clinicians' guide to adult ADHD: assessment and intervention* (pp. 43-69). Amsterdam: Academic Press.
- Barkley, R. A., Murphy, K. R., O'Connell, T., & Connor, D. F. (2005). Effects of two doses of methylphenidate on simulator driving performance in adults with attention deficit hyperactivity disorder. *Journal of Safety Research, 36*(2), 121-131.
- Barkley, R. A., Murphy, K. R., & Fischer, M. (2008). *ADHD in adults: What the science says*. New York: Guilford Press.
- Basco, M. R., Bostic, J. Q., Davies, D., Rush, A. J., Witte, B., Hendrickse, W., et al., (2000). Methods to Improve Diagnostic Accuracy in a Community Mental Health Setting. *American Journal of Psychiatry, 157*(10), 1599-1605.

- Baum, A., Revenson, T. A., & Singer, J. E. (2001). *Handbook of health psychology*. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
- Baum, A., & Posluszny, D. M. (1999). Health Psychology: Mapping biobehavioral contributions to health and illness. *Annual Review of Psychology*, *50*(1), 137-163.
- Beautrais, A., Joyce, P., Mulder, R., Fergusson, D., Deavoll, B., & Nightingale, S. (1996). Prevalence and comorbidity of mental disorders in persons making serious suicide attempts: a case-control study. *American Journal of Psychiatry*, *153*(8), 1009-1014.
- Becker, M. H., & Maiman, L. A. (1975). Sociobehavioral determinants of compliance with health and medical care recommendations. *Medical Care*, *13*(1), 10-24.
- Bernstein, D., & Fink, L. (1998). *Manual for the Childhood Trauma Questionnaire*. New York: The Psychological Corporation.
- Biederman, J., Faraone, S. V., & Monuteaux, M.C. (2002). Impact of exposure to parental attention-deficit hyperactivity disorder on clinical features and dysfunction in the offspring. *Psychological Medicine*, *32*(05), 817-827.
- Biederman, J., Faraone, S. V., Spencer, T., Wilens, T., Norman, D., Lapey, K. A., et al. (1993). Patterns of psychiatric comorbidity, cognition, and psychosocial functioning in adults with attention deficit hyperactivity disorder. *American Journal of Psychiatry*, *150*(12), 1792-1798.
- Biederman, J. (1998). Attention-deficit/hyperactivity disorder: a life-span perspective. *The Journal of Clinical Psychiatry*, *59* Suppl 7, 4-16.
- Biederman, J., Mick, E., & Faraone, S. V. (2000). Age-dependent decline of symptoms of attention deficit hyperactivity disorder: impact of remission definition and symptom type. *The American Journal of Psychiatry*, *157*(5), 816-818.
- Biederman, J., & Spencer, T. (2000). Non-stimulant treatments for ADHD. *European Child & Adolescent Psychiatry*, *9*(1), S51-S59.

- Biederman, J., Monuteaux, M. C., Mick, E., Spencer, T., Wilens, T. E., Silva, J. M., et al. (2006). Young adult outcome of attention deficit hyperactivity disorder: a controlled 10-year follow-up study. *Psychological Medicine*, *36*(02), 167-179.
- Billings, A. G., & Moos, R. H. (1984). Coping, stress, and social resources among adults with unipolar depression. *Journal of Personality and Social Psychology*, *46*(4), 877-891.
- Bollen, K., & Pearl, J. (2012). Eight myths about causality and structural equation models. In S. Morgan (Ed.), *Handbook of Causal Analysis for Social Research*. New York: Springer. New York: Springer.
- Boyle, C. A., Boulet, S., Schieve, L. A., Cohen, R. A., Blumberg, S. J., Yeargin-Allsopp, M., et al. (2011). Trends in the prevalence of developmental disabilities in US children, 1997-2008. *Pediatrics*, *127*(6), 1034-1042.
- Brent, D. A., Johnson, B. A., Perper, J., Connolly, J., Bridge, J., Bartle, S., et al. (1994). Personality disorder, personality traits, impulsive violence, and completed suicide in adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, *33*(8), 1080-1086.
- Breyer, J., Botzet, A., Winters, K., Stinchfield, R., August, G., & Realmuto, G. (2009). Young adult gambling behaviors and their relationship with the persistence of ADHD. *Journal of Gambling Studies*, *25*(2), 227-238.
- Brezo, J., Paris, J., Tremblay, R., Vitaro, F., Zoccolillo, M., Hébert, M., et al. (2006). Personality traits as correlates of suicide attempts and suicidal ideation in young adults. *Psychological Medicine*, *36*(02), 191-202.
- Briere, J. (1996). *Therapy for adults molested as children: Beyond survival*. New York: Springer Publishing Company.
- Briscoe-Smith, A. M., & Hinshaw, S. P. (2006). Linkages between child abuse and attention-deficit/hyperactivity disorder in girls: Behavioral and social correlates. *Child Abuse & Neglect*, *30*(11), 1239-1255.
- Brod, M., Johnston, J., Able, S., & Swindle, R. (2006). Validation of the Adult Attention-Deficit/Hyperactivity Disorder Quality-of-Life Scale (AAQoL):

- A disease-specific quality-of-life measure. *Quality of Life Research*, 15(1), 117-129.
- Brodsky, B. S., Oquendo, M., Ellis, S. P., Haas, G. L., Malone, K. M., & Mann, J. J. (2001). The relationship of childhood abuse to impulsivity and suicidal behavior in adults with major depression. *American Journal of Psychiatry*, 158(11), 1871-1877.
- Brown, T. A., Chorpita, B. F., Korotitsch, W., & Barlow, D. H. (1997). Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. *Behaviour Research and Therapy*, 35(1), 79-89.
- Brown, R. T., & Pacini, J. N. (1989). Perceived family functioning, marital status, and depression in parents of boys with Attention Deficit Disorder. *Journal of Learning Disabilities*, 22(9), 581-587.
- Castellanos, F. X., & Tannock, R. (2002). Neuroscience of attention-deficit/hyperactivity disorder: the search for endophenotypes. *Nature Reviews Neuroscience*, 3(8), 617-628.
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychological Medicine*, 33(3), 395-405.
- CDC (2007). *Youth Risk Behavior Survey*. Retrieved 10th November 2007 from <http://www.cdc.gov/yrbs> .
- Chacko, A., Pelham, W. E., Gnagy, E. M., Greiner, A., Vallano, G., Bukstein, O., et al. (2005). Stimulant medication effects in a summer treatment program among young children with attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, 44(3), 249-257.
- Chacko, A., H. Newcorn, J., Feirsen, N., & Z. Uderman, J. (2010). Improving medication adherence in chronic pediatric health conditions: a focus on ADHD in youth. *Current Pharmaceutical Design*, 16(22), 2416-2423.
- Chronis-Tuscano, A., Molina, B. S. G., Pelham, W. E., Applegate, B., Dahlke, A., Overmyer, M., et al. (2010). Very early predictors of adolescent depression

and suicide attempts in children with attention-deficit/hyperactivity disorder. *Archives of General Psychiatry*, 67(10), 1044-1051.

- Chronis-Tuscano, A., Raggi, V., Clarke, T., Rooney, M., Diaz, Y., & Pian, J. (2008). Associations between maternal attention-deficit/hyperactivity disorder symptoms and parenting. *Journal of Abnormal Child Psychology*, 36(8), 1237-1250.
- Cicerone, K. D., Mott, T., Azulay, J., Sharlow-Galella, M. A., Ellmo, W. J., Paradise, S., et al. (2008). A Randomized controlled trial of holistic neuropsychologic rehabilitation after traumatic brain injury. *Archives of physical medicine and rehabilitation*, 89(12), 2239-2249.
- Clancy, T. A., Rucklidge, J. J., & Owen, D. (2006). Road-Crossing safety in virtual reality: a comparison of adolescents with and without ADHD. *Journal of Clinical Child & Adolescent Psychology*, 35(2), 203-215.
- Clark, D. M., Wells, A., Heimberg, R. G., Liebowitz, M. R., Hope, D. A., & Schneier, F. R. (1995). A cognitive model of social phobia in *Social phobia: Diagnosis, assessment, and treatment*. (pp. 69-93): New York: Guilford Press.
- Coghill, D., Soutullo, C., d'Aubuisson, C., Preuss, U., Lindback, T., Silverberg, M., et al. (2008). Impact of attention-deficit/hyperactivity disorder on the patient and family: results from a European survey. *Child and Adolescent Psychiatry and Mental Health*, 2(1), 1-15.
- Conley, T. B. (2001). Construct validity of the MAST and AUDIT with multiple offender drunk drivers. *Journal of Substance Abuse Treatment*, 20(4), 287-295.
- Conners, C. K., Erhardt, D., & Sparrow, E. (1999). *Conners' Adult ADHD Rating Scales (CAARS) technical manual*. North Tonawanda, NY: Multi-Health Systems, Inc.
- Cortese, S., & Morcillo Penalver, C. (2010). Comorbidity between ADHD and obesity: exploring shared mechanisms and clinical implications. *Postgraduate Medicine*, 122(5), 88-96.

- Cunningham, C. E., Benness, B. B., & Siegel, L. S. (1988). Family functioning, time allocation, and parental depression in the families of normal and ADDH children. *Journal of Clinical Child Psychology, 17*(2), 169-177.
- Cupitt, C. (1998). Sexual History Questionnaire. In C. M. Davis, W. L. Yarber, R. Bauserman, G. Schreer & S. L. Davis (Eds.), *Handbook of sexuality-related measures* (pp. 106-108). Thousand Oaks, CA: Sage Publications.
- Darredeau, C., Barrett, S. P., Jardin, B., & Pihl, R. O. (2007). Patterns and predictors of medication compliance, diversion, and misuse in adult prescribed methylphenidate users. *Human Psychopharmacology: Clinical and Experimental, 22*(8), 529-536.
- Davis, P., McLeod, K., Ransom, M., & Ongley, P. (1997). *The New Zealand Socioeconomic Index of Occupational Status (NZSEI)*. Wellington, New Zealand: Statistics New Zealand.
- De Bellis, M. D., Broussard, E. R., Herring, D. J., Wexler, S., Moritz, G., & Benitez, J. G. (2001). Psychiatric co-morbidity in caregivers and children involved in maltreatment: a pilot research study with policy implications. *Child Abuse & Neglect, 25*(7), 923-944.
- de Boo, G. M., & Prins, P. J. M. (2007). Social incompetence in children with ADHD: Possible moderators and mediators in social-skills training. *Clinical Psychology Review, 27*(1), 78-97.
- de Graaf, R., Kessler, R. C., Fayyad, J., ten Have, M., Alonso, J., Angermeyer, M., et al. (2008). The prevalence and effects of adult attention-deficit/hyperactivity disorder (ADHD) on the performance of workers: results from the WHO World Mental Health Survey Initiative. *Occupational and Environmental Medicine, 65*(12), 835-842.
- de Wit, H. (2009). Impulsivity as a determinant and consequence of drug use: a review of underlying processes. *Addiction Biology, 14*(1), 22-31.
- Diller, L., & Goldstein, S. (2006). Science, ethics, and the psychosocial treatment of ADHD. *Journal of Attention Disorders, 9*(4), 571-574.

- Dixon, E. B. (1995). Impact of adult ADD on the family. In K. G. Nadeau (Ed.), *A Comprehensive Guide to Attention Deficit Disorder in Adults: Research, Diagnosis and Treatment* (pp. 236-259). New York: Bruner/ Mazel.
- Dowson, J. H., & Blackwell, A. D. (2010). Impulsive aggression in adults with attention-deficit/hyperactivity disorder. *Acta Psychiatrica Scandinavica*, *121*(2), 103-110.
- DSM-5 Task Force (2010). Proposed draft revisions to DSM disorders and criteria: American Psychiatric Association. Retrieved 03 April 2012 from <http://www.dsm5.org>
- Dulcan, M. (1997). Practice parameters for the assessment and treatment of children, adolescents, and adults with attention-deficit/hyperactivity disorder. American Academy of Child and Adolescent Psychiatry. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*(10 Suppl), 85S-121S.
- DVDRRC (2008). *Sixth Annual Report of the Domestic Violence Death Review Committee*. Ontario, Canada: Office of the Chief Coroner. Retrieved on 08 April 2012 from <http://www.mcscs.jus.gov.on.ca>
- Eakin, L., Minde, K., Hechtman, L., Ochs, E., Krane, E., Bouffard, R., et al. (2004). The marital and family functioning of adults with ADHD and their spouses. *Journal of Attention Disorders*, *8*(1), 1-10.
- Edbom, T., Granlund, M., Lichtenstein, P., & Larsson, J.-O. (2008). ADHD symptoms related to profiles of self-esteem in a longitudinal study of twins: A person-oriented approach. *Journal of Child and Adolescent Psychiatric Nursing*, *21*(4), 228-237.
- Edwards, M. J., & Holden, R. R. (2001). Coping, meaning in life, and suicidal manifestations: Examining gender differences. *Journal of Clinical Psychology*, *57*(12), 1517-1534.
- Endler, N. S., & Parker, J. D. A. (1990). *Coping Inventory for Stressful Situations (CISS): Manual*. Toronto: Multi-Health Systems.

- Endler, N. S., & Parker, J. D. A. (1994). Assessment of multidimensional coping: Task, emotion, and avoidance strategies. *Psychological Assessment, 6*(1), 50-60.
- Endler, N. S., & Parker, J. D. A. (1999). *Coping Inventory for Stressful Situations (CISS): Manual* (Revised ed.). Toronto: Multi-Health Systems.
- Engle, R. W., Tuholski, S. W., Laughlin, J. E., & Conway, A. R. A. (1999). Working memory, short-term memory, and general fluid intelligence: A latent-variable approach. *Journal of Experimental Psychology: General, 128*(3), 309-331.
- Epstein, J. N., Johnson, D., & Conners, C. K. (2000). *Conners' Adult ADHD Diagnostic Interview for DSM-IV*. North Tonawanda, NY: Multi-Health Systems, Inc.
- Epstein, J. N., & Kollins, S. H. (2006). Psychometric Properties of an Adult ADHD Diagnostic Interview. *Journal of Attention Disorders, 9*(3), 504-514.
- Erhardt, D., Epstein, J. N., Conners, C. K., Parker, J. D. A., & Sitarenios, G. (1999). Self-ratings of ADHD symptoms in adults II: Reliability, validity, and diagnostic sensitivity. *Journal of Attention Disorders, 3*(3), 153-158.
- Erhardt, D., & Hinshaw, S. P. (1994). Initial sociometric impressions of attention-deficit hyperactivity disorder and comparison boys: Predictions from social behaviors and from nonbehavioral variables. *Journal of Consulting and Clinical Psychology, 62*(4), 833-842.
- Evans, J., Platts, H., & Liebenau, A. (1996). Impulsiveness and deliberate self-harm: a comparison of 'first-timers' and 'repeaters'. *Acta Psychiatrica Scandinavica, 93*(5), 378-380.
- Farah, M., Haimm, C., Sankoorikal, G., & Chatterjee, A. (2009). When we enhance cognition with Adderall, do we sacrifice creativity? A preliminary study. *Psychopharmacology, 202*(1), 541-547.

- Faraone, S. V., Biederman, J., Jetton, J. G., & Tsuang, M. T. (1997). Attention deficit disorder and conduct disorder: longitudinal evidence for a familial subtype. *Psychological Medicine*, *27*(02), 291-300.
- Faraone, S. V., Biederman, J., Weber, W., & Russell, R. L. (1998). Psychiatric, neuropsychological, and psychosocial features of DSM-IV subtypes of attention-deficit/hyperactivity disorder: Results from a clinically referred sample. *Journal of the American Academy of Child & Adolescent Psychiatry*, *37*(2), 185-193.
- Farmer, R., & Rucklidge, J. (2006). An evaluation of the response modulation hypothesis in relation to attention- deficit/hyperactivity disorder. *Journal of Abnormal Child Psychology*, *34*(4), 542-554.
- Fergusson, D. M., Horwood, L. J., & Lynskey, M. T. (1996). Childhood sexual abuse and psychiatric disorder in young adulthood: II. psychiatric outcomes of childhood sexual abuse. *Journal of the American Academy of Child & Adolescent Psychiatry*, *35*(10), 1365-1374.
- Fergusson, D. M., Horwood, L. J., & Woodward, L. J. (2000). The stability of child abuse reports: a longitudinal study of the reporting behaviour of young adults. *Psychological Medicine*, *30*(03), 529-544.
- First, M., Spitzer, R., Gibbon, M., & Williams, J. (2002). *Structured Clinical Interview for DSM-IV Axis I Disorders, Research Version, Non-patient Edition (SCID-I/NP)*. New York: New York State Psychiatric Institute, Biometrics Research.
- Fliege, H., Kocalevent, R.-D., Walter, O. B., Beck, S., Gratz, K. L., Gutierrez, P. M., et al. (2006). Three assessment tools for deliberate self-harm and suicide behavior: evaluation and psychopathological correlates. *Journal of Psychosomatic Research*, *61*(1), 113-121.
- Ford, J. D., Racusin, R., Ellis, C. G., Daviss, W. B., Reiser, J., Fleischer, A., et al. (2000). Child maltreatment, other trauma exposure, and posttraumatic symptomatology among children with oppositional defiant and attention deficit hyperactivity disorders. *Child Maltreatment*, *5*(3), 205-217.

- Friedman, S. R., Rapport, L. J., Lumley, M., Tzelepis, A., VanVoorhis, A., Stettner, L., et al. (2003). Aspects of social and emotional competence in adult attention-deficit/hyperactivity disorder. *Neuropsychology, 17*(1), 50-58.
- Funk, J. B., Chessare, J. B., Weaver, M. T., & Exley, A. R. (Writer) (1993). Attention deficit/ hyperactivity disorder, creativity, and the effects of methylphenidate. *Pediatrics, 91* (04), 816-819.
- Galéra, C., Bouvard, M. P., Encrenaz, G., Messiah, A., & Fombonne, E. (2008). Hyperactivity-inattention symptoms in childhood and suicidal behaviors in adolescence: the Youth Gazel Cohort. *Acta Psychiatrica Scandinavica, 118*(6), 480-489.
- Garner, D. M., & Garfinkel, P. E. (1979). The Eating Attitudes Test: an index of the symptoms of anorexia nervosa. *Psychological Medicine, 9*(02), 273-279.
- Gaub, M., & Carlson, C. L. (1997). Gender differences in ADHD: A meta-analysis and critical review. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(8), 1036-1045.
- Gibbins, C., Weiss, M. D., Goodman, D. W., Hodgkins, P. S., Landgraf, J. M., & Faraone, S. V. (2010). ADHD-hyperactive/impulsive subtype in adults (Vol. 2). *Mental Illness, 2* (01).
- Goodman, G., Gerstadt, C., Pfeffer, C. R., Stroh, M., & Valdez, A. (2008). ADHD and aggression as correlates of suicidal behavior in assaultive prepubertal psychiatric inpatients. *Suicide and Life-Threatening Behavior, 38*(1), 46-59.
- Gratz, K. (2001). Measurement of deliberate self-harm: preliminary data on the Deliberate Self-Harm Inventory. *Journal of Psychopathology and Behavioral Assessment, 23*(4), 253-263.
- Green, L., Fry, A. F., & Myerson, J. (1994). Discounting of delayed rewards: A life-span comparison. *Psychological Science, 5*(1), 33-36.

- Green, M. F. (1996). What are the functional consequences of neurocognitive deficits in schizophrenia? *American Journal of Psychiatry*, 153(3), 321-330.
- Hallowell, E. M., & Ratey, J. J. (1994). *Driven to Distraction: Recognizing and Coping with Attention Deficit Disorder from Childhood through Adulthood*: Old Tappan, NJ, Simon & Schuster.
- Harvey, E., Danforth, J. S., McKee, T. E., Ulaszek, W. R., & Friedman, J. L. (2003). Parenting of children with attention-deficit/hyperactivity disorder (ADHD): The role of parental ADHD symptomatology. *Journal of Attention Disorders*, 7(1), 31-42.
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, 76(4), 408-420.
- Hesslinger, B., Tebartz van Elst, L., Mochan, F., & Ebert, D. (2003). A psychopathological study into the relationship between attention deficit hyperactivity disorder in adult patients and recurrent brief depression. *Acta Psychiatrica Scandinavica*, 107(5), 385-389.
- Heiligenstein, E., Conyers, L. M., Berns, A. R., Miller, M. A., & Smith, M. A. (1998). Preliminary normative data on DSM-IV attention deficit hyperactivity disorder in college students. *Journal of American college health*, 46(4), 185-188.
- Hingson, R. W., Strunin, L., Berlin, B. M., & Heeren, T. (1990). Beliefs about AIDS, use of alcohol and drugs, and unprotected sex among Massachusetts adolescents. *American Journal of Public Health*, 80(3), 295-299.
- Horesh, N., Gothelf, D., Ofek, H., Weizman, T., & Apter, A. (1999). Impulsivity as a correlate of suicidal behavior in adolescent psychiatric inpatients. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 20(1), 8-14.
- Huang-Pollock, C., Mikami, A., Pfiffner, L., & McBurnett, K. (2009). Can executive functions explain the relationship between attention deficit

- hyperactivity disorder and social adjustment? *Journal of Abnormal Child Psychology*, 37(5), 679-691.
- Izutsu, T., Shimotsu, S., Matsumoto, T., Okada, T., Kikuchi, A., Kojimoto, M., et al. (2006). Deliberate self-harm and childhood hyperactivity in junior high school students. *European Child & Adolescent Psychiatry*, 15(3), 172-176.
- Jackson, K. M., & Aiken, L. S. (2000). A psychosocial model of sun protection and sunbathing in young women: The impact of health beliefs, attitudes, norms, and self-efficacy for sun protection. *Health Psychology*, 19(5), 469-478.
- James, A., Lai, F. H., & Dahl, C. (2004). Attention deficit hyperactivity disorder and suicide: A review of possible associations. *Acta Psychiatrica Scandinavica*, 110(6), 408-415.
- Jin, C., & Schachar, R. (2004). Focus points. *CNS Spectrums*, 9(3), 217-226.
- Jonah, B. A., Thiessen, R., & Au-Yeung, E. (2001). Sensation seeking, risky driving and behavioral adaptation. *Accident Analysis & Prevention*, 33(5), 679-684.
- Johnson, D., & Conners, C. K. (2002). The Assessment process: conditions and comorbidities. In S. Goldstein & A. T. Ellison (Eds.), *Clinicians' Guide to Adult ADHD: Assessment and Intervention*. San Diego: Academic Press.
- Kahn, J. A., Kaplowitz, R. A., Goodman, E., & Emans, S. J. (2002). The association between impulsiveness and sexual risk behaviors in adolescent and young adult women. *Journal of Adolescent Health*, 30(4), 229-232.
- Kane, M., & Engle, R. (2002). The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: An individual-differences perspective. *Psychonomic Bulletin & Review*, 9(4), 637-671.
- Kaya, A., Taner, Y., Guclu, B., Taner, E., Kaya, Y., Bahcivan, H. G., et al. (2008). Trauma and adult attention deficit hyperactivity disorder. *The Journal of International Medical Research*, 36(1), 9-16.

- Kelleher, C., Nic Gabhainn, S., Friel, S., Corrigan, H., Nolan, G., Sixsmith, J., et al. (2003). *The National Health and Lifestyles Surveys. Survey of Lifestyle, Attitudes and Nutrition (SLÁN) and the Irish Health Behaviour in School-aged Children (HBSC) Survey 2002*. Retrieved from <http://www.dohc.ie/publications> on 06 November 2007
- Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, C. K., Demler, O., et al. (2006). The prevalence and correlates of adult ADHD in the United States: Results from the National Comorbidity Survey Replication. *American Journal of Psychiatry*, *163*(4), 716-723.
- Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-Month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 617-627.
- Klein, R. G., & Mannuzza, S. (2010). Comorbidity in adult attention-deficit hyperactivity disorder. In W. Retz & R. G. Klein (Eds.), *Attention-deficit hyperactivity disorder (ADHD) in adults: Key Issues in Mental Health*. (Vol. 176, pp. 126-143). New York: Karger.
- Lahey, B. B., Pelham, W. E., Loney, J., Lee, S. S., & Willcutt, E. (2005). Instability of the DSM-IV subtypes of ADHD from preschool through elementary school. *Archives of General Psychiatry*, *62*(8), 896-902.
- Laurence, S. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, *28*(1), 78-106.
- Lezak, M. D. (2004). *Neuropsychological Assessment*: Oxford: Oxford University Press.
- Linn, M. W. (1985). A Global Assessment of Recent Stress (GARS) Scale. *International Journal of Psychiatry in Medicine*, *15*(1), 47-59.
- Lip, G. Y. H., Luscombe, C., McCarry, M., Malik, I., & Beevers, G. (1996). Ethnic differences in public health awareness, health perceptions and physical exercise: Implications for heart disease prevention. *Ethnicity & Health*, *1*(1), 47-53.

- Loeber, R., Green, S. M., Lahey, B. B., Christ, M. A. G., & Frick, P. J. (1992). Developmental sequences in the age of onset of disruptive child behaviors. *Journal of Child and Family Studies*, 1(1), 21-41.
- Lovibond, S. H., & Lovibond, P. F. (1993). Manual for the Depression Anxiety Stress Scales (DASS), *Psychology Foundation Monograph*. Sydney: The Psychology Foundation, University of New South Wales.
- Luman, M., van Meel, C., Oosterlaan, J., & Geurts, H. (2012). Reward and punishment sensitivity in children with ADHD: Validating the Sensitivity to Punishment and Sensitivity to Reward Questionnaire for Children (SPSRQ-C). *Journal of Abnormal Child Psychology*, 40(1), 145-157.
- Macmillan, Harriet, L., Fleming, Jan, E., Streiner, David, L., et al. (2001). *Childhood abuse and lifetime psychopathology in a community sample* (Vol. 158). Arlington, VA: American Psychiatric Association.
- Mandal, E., & Zalewska, K. (2010). Psychological femininity and masculinity, self-appeal, attachment styles, coping styles and strategies of self-presentation among women with suicide attempts. *Psychiatra Polska*, 44(3), 329-339.
- Mangus, R. S., Bergman, D., Zieger, M., & Coleman, J. J. (2004). Burn injuries in children with attention-deficit/hyperactivity disorder. *Burns*, 30(2), 148-150.
- Mannuzza, S., Klein, R. G., Bessler, A., Malloy, P., & LaPadula, M. (1993). Adult outcome of hyperactive boys: Educational achievement, occupational rank, and psychiatric status. *Archives of General Psychiatry*, 50(7), 565-576.
- Mannuzza, S., Klein, R. G., Klein, D. F., Bessler, A., & ShROUT, P. (2002). Accuracy of adult recall of childhood attention deficit hyperactivity disorder. *American Journal of Psychiatry*, 159(11), 1882-1888.
- Merrill, R., Lyon, J., Baker, R., & Gren, L. (2009). Attention deficit hyperactivity disorder and increased risk of injury. *Advances in Medical Sciences*, 54(1), 20-26.

- Mick, E., Faraone, S. V., & Biederman, J. (2004). Age-dependent expression of attention-deficit/hyperactivity disorder symptoms. *The Psychiatric clinics of North America*, 27(2), 215-224.
- Miles, D. R., van den Bree, M. B. M., Gupman, A. E., Newlin, D. B., Glantz, M. D., & Pickens, R. W. (2001). A twin study on sensation seeking, risk taking behavior and marijuana use. *Drug and Alcohol Dependence*, 62(1), 57-68.
- Milich, R., Balentine, A. C., & Lynam, D. R. (2001). ADHD combined type and ADHD predominantly inattentive type are distinct and unrelated disorders. *Clinical Psychology: Science and Practice*, 8(4), 463-488.
- Millstein, R. B., Wilens, T. E., Biederman, J., & Spencer, T. J. (1997). Presenting ADHD symptoms and subtypes in clinically referred adults with ADHD. *Journal of Attention Disorders*, 2(3), 159-166.
- Mulsow, M. H., O'Neal, K. K., & Murry, V. M. (2001). Adult attention deficit hyperactivity disorder, the family, and child maltreatment. *Trauma, Violence, & Abuse*, 2(1), 36-50.
- Murphy, K. R., Barkley, R. A., & Bush, T. (2002). Young adults with attention deficit hyperactivity disorder: Subtype differences in comorbidity, educational, and clinical history. *The Journal of Nervous and Mental Disease*, 190(3), 147-157.
- Murphy, B. C., Shepard, S. A., Eisenberg, N., & Fabes, R. A. (Writer) (2004). Concurrent and across time prediction of young adolescents' social functioning: The role of emotionality and regulation. *Social Development*, 13 (01), 56-86.
- Murphy, K., & Barkley, R. A. (1996). Attention deficit hyperactivity disorder adults: Comorbidities and adaptive impairments. *Comprehensive Psychiatry*, 37(6), 393-401.
- Murray, C., & Johnston, C. (2006). Parenting in mothers with and without attention-deficit/ hyperactivity disorder. *Journal of Abnormal Psychology*, 115(1), 52-61.

- Muthén, L. K., & Muthén, B. O. (2007). *Mplus User's Guide*. (5th ed.). Los Angeles, CA: Muthén & Muthén.
- Neigh, G. N., Gillespie, C. F., & Nemeroff, C. B. (2009). The neurobiological toll of child abuse and neglect. *Trauma, Violence, & Abuse, 10*(4), 389-410.
- Nicholls, E., Hildenbrand, A. K., Aggarwal, R., McCarthy, L., & Daly, B. (2012). The Use of Stimulant Medication to Treat Neurocognitive Deficits in Patients with Pediatric Cancer, Traumatic Brain Injury, and Sickle Cell Disease. *Postgraduate medicine, 124*(5).
- Nigg, J. T., Hinshaw, S. P., Carte, E. T., & Treuting, J. J. (1998). Neuropsychological correlates of childhood attention-deficit/hyperactivity disorder: Explainable by comorbid disruptive behavior or reading problems? *Journal of Abnormal Psychology, 107*(3), 468-480.
- Nigg, J. T. (2000). On inhibition/disinhibition in developmental psychopathology: Views from cognitive and personality psychology and a working inhibition taxonomy. *Psychological Bulletin, 126*(2), 220-246.
- Nigg, J. T. (2005). Neuropsychologic theory and findings in attention-deficit/hyperactivity disorder: The state of the field and salient challenges for the coming decade. *Biological Psychiatry, 57*(11), 1424-1435.
- Nigg, J., & Seargent, J. (2006). *What Causes ADHD?: Understanding What Goes Wrong and Why*. New York: Guilford Publications.
- Nock, M. K., Joiner Jr, T. E., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research, 144*(1), 65-72.
- Nock, M. K., Wedig, M. M., Holmberg, E. B., & Hooley, J. M. (2008). The Emotion Reactivity Scale: Development, evaluation, and relation to self-injurious thoughts and behaviors. *Behavior Therapy, 39*(2), 107-116.
- Ouyang, L., Fang, X., Mercy, J., Perou, R., & Grosse, S. D. (2008). Attention-deficit/hyperactivity disorder symptoms and child maltreatment: A population-based study. *The Journal of pediatrics, 153*(6), 851-856.

- Paivio, S. C., & Cramer, K. M. (2004). Factor structure and reliability of the Childhood Trauma Questionnaire in a Canadian undergraduate student sample. *Child Abuse & Neglect*, 28(8), 889-904.
- Parker, J. G., & Asher, S. R. (1987). Peer relations and later personal adjustment: Are low-accepted children at risk? *Psychological Bulletin*, 102(3), 357-389.
- Pelham, W. E., Foster, E. M., & Robb, J. A. (2007). The Economic impact of attention-deficit/hyperactivity disorder in children and adolescents. *Ambulatory pediatrics : the official journal of the Ambulatory Pediatric Association*, 7(1), 121-131.
- Philipsen, A., Feige, B., Hesslinger, B., Scheel, C., Ebert, D., Matthies, S., et al. (2009). Borderline typical symptoms in adult patients with attention deficit/hyperactivity disorder. *ADHD Attention Deficit and Hyperactivity Disorders*, 1(1), 11-18.
- Pianta, R., Egeland, B., & Farrell Erickson, M. (1989). The antecedents of maltreatment: Results of the Mother-Child Interaction Research Project. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: theory and research on the causes and consequences of child abuse and neglect*. Cambridge, United Kingdom: Cambridge University Press.
- Pomerleau, C. S., Downey, K. K., Snedecor, S. M., Mehringer, A. M., Marks, J. L., & Pomerleau, O. F. (2003). Smoking patterns and abstinence effects in smokers with no ADHD, childhood ADHD, and adult ADHD symptomatology. *Addictive Behaviors*, 28(6), 1149-1157.
- Preacher, K., & Hayes, A. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879-891.
- Psychogiou, L., Daley, D. M., Thompson, M. J., & Sonuga-Barke, E. J. S. (2008). Do maternal attention-deficit/hyperactivity disorder symptoms exacerbate or ameliorate the negative effect of child attention-deficit/hyperactivity disorder symptoms on parenting? *Development and Psychopathology*, 20(01), 121-137.

- Raffaelli, M., & Crockett, L. J. (2003). Sexual risk taking in adolescence: The role of self-regulation and attraction to risk. *Developmental Psychology, 39*(6), 1036-1046.
- Ramírez, J. M., & Andreu, J. M. (2006). Aggression and some related psychological constructs (anger, hostility, and impulsivity): Some comments from a research project. *Neuroscience & Biobehavioral Reviews, 30*(3), 276-291.
- Ramsey, J., & Rostain, A. (2005). Attention-deficit/hyperactivity disorder (ADHD)-adult. In A. Freeman, S. H. Felgoise, C. M. Nezu, A. M. Nezu, M. A. Reinecke, J. Ramsey et al. (Eds.), *Encyclopedia of Cognitive Behavior Therapy* (pp. 52-54). New York: Springer.
- Rath, J. F., Simon, D., Langenbahn, D. M., Sherr, R. L., & Diller, L. (2003). Group treatment of problem-solving deficits in outpatients with traumatic brain injury: A randomised outcome study. *Neuropsychological Rehabilitation, 13*(4), 461-488.
- Retz, W., & Rösler, M. (2010). Association of ADHD with reactive and proactive violent behavior in a forensic population. *ADHD Attention Deficit and Hyperactivity Disorders, 2*(4), 195-202.
- Richards, J. B., Zhang, L., Mitchell, S. H., & de Wit, H. (1999). Delay or probability discounting in a model of impulsive behavior: Effect of alcohol. *Journal of the Experimental Analysis of Behavior, 71*(2), 121-143.
- Rucklidge, J. J., Brown, D. L., Crawford, S., & Kaplan, B. J. (2006). Retrospective reports of childhood trauma in adults with ADHD. *Journal of Attention Disorders, 9*(4), 631-641.
- Schatz, D. B., & Rostain, A. L. (2006). ADHD with comorbid anxiety. *Journal of Attention Disorders, 10*(2), 141-149.
- Sarason, I. G., Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). A Brief measure of social support: practical and theoretical implications. *Journal of Social and Personal Relationships, 4*(4), 497-510.

- Scheres, A., Lee, A., & Sumiya, M. (2008). Temporal reward discounting and ADHD: task and symptom specific effects. *Journal of Neural Transmission, 115*(2), 221-226.
- Seidman, S. N., & Rieder, R. O. (1994). A review of sexual behavior in the United States. *The American Journal of Psychiatry, 151*(3), 330-341.
- Selzer, M. L. (1971). The Michigan Alcoholism Screening Test: The quest for a new diagnostic instrument. *American Journal of Psychiatry, 127*(12), 1653-1658.
- Sergeant, J. A., Geurts, H., & Oosterlaan, J. (2002). How specific is a deficit of executive functioning for Attention-Deficit/Hyperactivity Disorder? *Behavioural Brain Research, 130*(1-2), 3-28.
- Shelley-Tremblay, J. F., & Rosen, L. A. (1996). Attention deficit hyperactivity disorder: An evolutionary perspective. *Journal of Genetic Psychology, 157*(4), 443.
- Siebert, R. J., Patten, M. D., & Walkey, F. H. (1987). Development of a brief social support questionnaire. *New Zealand Journal of Psychology, 16*(2), 79-83.
- Skinner, H. A. (1982). The Drug Abuse Screening Test. *Addictive Behaviors, 7*(4), 363-371.
- Sobanski, E. (2006). Psychiatric comorbidity in adults with attention-deficit/hyperactivity disorder (ADHD). *European Archives of Psychiatry and Clinical Neuroscience, 256*(0).
- Sobanski, E., Brüggemann, D., Alm, B., Kern, S., Philipsen, A., Schmalzried, H. (2008). Subtype differences in adults with attention-deficit/hyperactivity disorder (ADHD) with regard to ADHD-symptoms, psychiatric comorbidity and psychosocial adjustment. *European Psychiatry, 23*(2), 142-149.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology, 13*, 290-312.

- Sonuga-Barke, E. J. S. (2003). The dual pathway model of AD/HD: an elaboration of neuro-developmental characteristics. *Neuroscience & Biobehavioral Reviews*, 27(7), 593-604.
- Sonuga-Barke, E. J. S., Daley, D., & Thompson, M. (2002). Does maternal ADHD reduce the effectiveness of parent training for preschool children's ADHD? *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 696-702.
- Sparrow, S. S., & Davis, S. M. (2000). Recent advances in the assessment of intelligence and cognition. *Journal of Child Psychology and Psychiatry*, 41(1), 117-131.
- Spencer, T. J., Biederman, J., & Mick, E. (2007). Attention-deficit/hyperactivity disorder: diagnosis, lifespan, comorbidities, and neurobiology. *Ambulatory Pediatrics*, 7(1, Supplement 1), 73-81.
- Sprafkin, J., Gadow, K. D., Weiss, M. D., Schneider, J., & Nolan, E. E. (2007). Psychiatric comorbidity in ADHD symptom subtypes in clinic and community adults. *Journal of Attention Disorders*, 11(2), 114-124.
- Stanford, M. S., Greve, K. W., Boudreaux, J. K., Mathias, C. W., & L. Brumbelow, J. (1996). Impulsiveness and risk-taking behavior: comparison of high-school and college students using the Barratt Impulsiveness Scale. *Personality and Individual Differences*, 21(6), 1073-1075.
- Stroebe, W. (2000). *Social Psychology and Health* (Second ed.). Buckingham: Open University Press.
- Stuart, G., & Holtzworth-Munroe, A. (2005). Testing a theoretical model of the relationship between impulsivity, mediating variables, and husband violence. *Journal of Family Violence*, 20(5), 291-303.
- Szymanski, K., Sapanski, L., & Conway, F. (2011). Trauma and ADHD-Association or Diagnostic Confusion? A Clinical Perspective. *Journal of Infant, Child, and Adolescent Psychotherapy*, 10(1), 51-59.
- Tapert, S. F., Aarons, G. A., Sedlar, G. R., & Brown, S. A. (2001). Adolescent substance use and sexual risk-taking behavior. *The Journal of adolescent*

- health : official publication of the Society for Adolescent Medicine*, 28(3), 181-189.
- Taylor, S., Thordarson, D. S., Maxfield, L., Fedoroff, I. C., Lovell, K., & Ogrodniczuk, J. (2003). Comparative efficacy, speed, and adverse effects of three PTSD treatments: Exposure therapy, EMDR, and relaxation training. *Journal of Consulting and Clinical Psychology*, 71(2), 330.
- Todd, R. D. (2000). Genetics of attention deficit/hyperactivity disorder: Are we ready for molecular genetic studies? *American Journal of Medical Genetics*, 96(3), 241-243.
- Torgersen, T., Gjervan, B., & Rasmussen, K. (2006). ADHD in adults: A study of clinical characteristics, impairment and comorbidity. *Nordic Journal of Psychiatry*, 60(1), 38-43.
- Torrubia, R., Ávila, C., Molto, J., & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences*, 31(6), 837-862.
- Tuckman, A. (2007). *Integrative Treatment for Adult ADHD: A Practical, Easy-To-Use Guide for Clinicians*. Oakland: New Harbinger.
- Tripp, G., & Wickens, J. R. (2009). Neurobiology of ADHD. *Neuropharmacology*, 57(7-8), 579-589.
- Unnever, J. D., & Cornell, D. G. (2003). Bullying, self-control, and ADHD. *Journal of Interpersonal Violence*, 18(2), 129-147.
- Van der Kolk, B. A. (2005). Developmental Trauma Disorder. *Psychiatric Annals*, 35(5), 401.
- Vuchinich, R. E., & Simpson, C. A. (1998). Hyperbolic temporal discounting in social drinkers and problem drinkers. *Experimental and Clinical Psychopharmacology*, 6(3), 292-305.
- Waschbusch, D. A., & Willoughby, M. T. (Writer) (2008). Attention-deficit/hyperactivity disorder and callous-unemotional traits as moderators

- of conduct problems when examining impairment and aggression in elementary school children. *Aggressive Behavior*, 35(2), 139-153.
- Wechsler, D. (1999). *Wechsler Abbreviated Scales of Intelligence (WASI)*. San Antonio, Texas: Psychological Corporation.
- Weinstein, D., Staffebach, D., & Biaggio, M. (2000). Attention-deficit hyperactivity disorder and posttraumatic stress disorder: Differential diagnosis in childhood sexual abuse. *Clinical Psychology Review*, 20(3), 359-378.
- Weiss, G., & Hechtman, L. T. (1993). *Hyperactive children grown up: ADHD in children, adolescents, and adults (2nd ed.)*: New York, US: Guilford Press.
- Weiss, L. (1997). *ADD and creativity*. Dallas, Tex.: Taylor Pub.
- Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of attention-deficit/hyperactivity disorder: A meta-analytic review. *Biological Psychiatry*, 57(11), 1336-1346.
- Williams, D., & Mateer, C. A. (1992). Developmental impact of frontal lobe injury in middle childhood. *Brain and Cognition*, 20(1), 196-204.
- Winstanley, C. A., Eagle, D. M., & Robbins, T. W. (2006). Behavioral models of impulsivity in relation to ADHD: Translation between clinical and preclinical studies. *Clinical Psychology Review*, 26(4), 379-395.
- Woodward, L. J., & Fergusson, D. M. (1999). Early conduct problems and later risk of teenage pregnancy in girls. *Development and Psychopathology*, 11(01), 127-141.
- Woodward, L. J., Fergusson, D. M., & Horwood, L. J. (2000). Driving outcomes of young people with attentional difficulties in adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, 39(5), 627-634.
- Yudko, E., Lozhkina, O., & Fouts, A. (2007). A comprehensive review of the psychometric properties of the Drug Abuse Screening Test. *Journal of Substance Abuse Treatment*, 32(2), 189-198.

**Appendix 1: Study Information Sheet and Consent Form****INFORMATION SHEET**

14<sup>th</sup> November, 2006

**Title of Research Project:** *Does Attention-Deficit/ Hyperactivity Disorder (ADHD) affect the way adults take health-risks?*

**Principle Investigator:** Mairin Taylor  
PhD Candidate, Clinical Psychology Student  
University of Canterbury  
Phone: 364- 2987 ext. 7191  
Email: mrt43@student.canterbury.ac.nz

**Research Supervisor:** Julia Rucklidge, Ph.D., C. Psych.  
Senior Lecturer and Registered Senior Psychologist  
University of Canterbury  
Phone: 364-2987 ext. 7959

**Ethical Approval:** Upper South B Regional Ethics Committee  
Ministry of Health (Ref: URB/06/10/076)

**Purpose of the Research:**

The purpose of this study is to find out more information about what it is like for adults to live with Attention-Deficit/Hyperactivity Disorder (ADHD), compared with adults without ADHD. In

particular we will be looking at how adults with ADHD behave in ways that may put their health at risk. We will ask questions about things like smoking, drinking, diet, driving and contraceptive use. We will also look at whether things like having supportive relationships or a lot of stress can affect the way that adults with ADHD look after their health. You have been invited to be part of this study *either* because you have been identified as having an attentional difficulty *or* **because you will be a comparison for individuals with such problems.**

### **Description of the Research:**

Participants in this study will be interviewed and tested at the Department of Psychology at the University of Canterbury. Prior to the day of testing, questionnaires will be sent out that you will be asked to complete and bring with you to your appointment. These questionnaires will be used to determine whether you will be suitable to take part in this study. Some people who would like to participate may not be suitable to do so. This will depend on things like whether there is evidence of ADHD and also how many participants we have already interviewed.

You may also be sent a questionnaire for someone close to you such as a partner, parent, family/whanau member or close friend. This is so that we can ask them about how you behave in other situations. You can choose who fills out this questionnaire and you can choose not to consent to this. If you are taking stimulant medication, you will be asked not to take this medication on the morning of the day of testing. This is standard practice in research with individuals with ADHD as the medication affects their performance on some of the tasks.

For your sessions at the university, we will review consent with you and answer any questions you may have. You will then be interviewed on how you are doing currently. The interview questions will ask you about your mood, coping and level of support as well as more sensitive questions about health or mental health problems you may have or had in the past. Not all questions need to be answered and the interview and/or tasks can be stopped at any time. For your second session, you will be asked to do a variety of tasks – this will include filling out questionnaires and checklists. These questionnaires will be about the following topic areas: ADHD; general intelligence; current occupation and number of children or dependent relatives; alcohol and drug use; sexual history; eating habits; health and lifestyle; self-harm behaviours; depression and anxiety; stress and coping, social support; childhood trauma. You will also be asked to take part in three computer tasks. The first computer task involves making decisions about pretend amounts of money. The second is a memory task involving pictures of faces. The third task involves memorising target numbers and trying to earn 10c pieces for an imaginary account.

It is expected that the interviews and the tasks will take a total of 5 hours of your time (2 sessions of 2-3 hours) **or one session lasting around 2 hours if you are a member of the comparison group (i.e. you do not have ADHD).** Please feel free to bring a support person such as a friend or family/whanau member with you to all or any of the sessions at the university. You can also use a whanau member or a friend to ask questions about this study.

As a consequence of the nature of the study, we will have some information about your current psychological functioning. You may consider that this information might be useful for yourself. You have a choice about what, if anything happens to this information outside the context of this

research. We can, with your written consent, release this information to you, or another person chosen by you. We strongly advise that this type of information only be interpreted by a professional who has been trained to do that. If an undiagnosed mental health or other health issue is discovered, you will be offered a referral to a suitable agency.

We will also ask whether you would like the results shared with your GP or mental health case manager and whether you would like to be contacted in the future about new studies. The Human Ethics committee at the University of Canterbury and the Canterbury Ethics Committee have reviewed and approved this study.

**Potential Harms (Injury, Discomforts or Inconvenience):**

There are no known harms associated with participation in this study.

**Potential Benefits:**

You may potentially benefit from participating in this study by receiving direct feedback about any attention problems you may have, as well as information about your current level of health risk taking. Further, in the bigger picture, we also hope that this information will be helpful in developing better treatment plans for people with attention and concentration problems.

**Confidentiality:**

We are very careful in dealing with confidential information; you can feel assured that all information you disclose concerning yourself will be kept in a confidential file which will be kept locked at all times. All information will be kept as group data. Therefore, forms will be coded and names removed so that you cannot be identified. Confidentiality will be respected and no information that discloses the identity of the participants will be released or published without your consent. In cases where we are concerned about the safety of you or the safety of others, we may decide to breach confidentiality.

The results of the tests described above will be used for research purposes only in the context of this study. We would need your permission and signed consent to send these test scores to another professional involved in your care. We recommend that a registered psychologist or physician interpret the results of these tests.

**Incentive:**

You will receive \$30 in the form of vouchers as a contribution towards your costs as well as free parking at the University of Canterbury.

**Participation:**

If you would like to participate in this study, please feel free to contact the principle researcher by phone or email. Participation in research is voluntary. Please feel free to discuss your participation with family/whanau or another support person. If you choose to participate in this study, you can

withdraw from the study at any time without having to give a reason. Withdrawing from this study will not stop you from receiving help from the public health service.

If you have any queries or concerns regarding your rights as a participant in the study, you may wish to contact a Health and Disability Services Consumer Advocate, telephone 377 7501 in Christchurch or 0800 377 766 outside Christchurch. You can also contact Mairin Taylor, principle researcher, 364-2987 ext.7191 should you have any questions or concerns about this research.

**CONSENT FORM**

**Title of Research Project: *Does Attention-Deficit/ Hyperactivity Disorder (ADHD) affect the way adults take health-risks?***

**Request for Interpreter**

English	I wish to have an interpreter.	Yes	No
Maori	E hiahia ana ahau ki tetahi kaiwhakamaori/kaiwhaka pakeha korero.	Ae	Kao
Cook Island	Ka inangaro au i tetai tangata uri reo.	Ae	Kare
Fijian	Au gadreva me dua e vakadewa vosa vei au	Io	Sega
Niuean	Fia manako au ke fakaaoga e taha tagata fakahokohoko kupu.	E	Nakai
Samoan	Ou te mana'o ia i ai se fa'amatala upu.	Ioe	Leai
Tokelaun	Ko au e fofou ki he tino ke fakaliliu te gagana Peletania ki na gagana o na motu o te Pahefika	Ioe	Leai
Tongan	Oku ou fiema'u ha fakatonulea.	Io	Ikai

**Consent:**

I have read and I understand the information sheet dated 14<sup>th</sup> November, 2006, for volunteers taking part in the study designed to investigate the health-risk behaviour of adults with attentional difficulties. I have had the time to consider whether to take part and I have had the opportunity to discuss this study. I am satisfied with the answers given. I have had the opportunity to use whanau support or a friend to understand this study and to give support. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time and this will in no way affect my future health care. I understand that my participation in this study is confidential and that no material which could identify me or my family will be used in any reports on this study. I also understand the incentive provisions for this study. I know who to contact if I have any questions about the study.





## Research Participants Wanted

Males between 25 and 60 years of age



I am undertaking research on adult Attention Deficit Hyperactivity Disorder (ADHD) and health behaviour at the Department of Psychology, University of Canterbury. I am looking for male participants without ADHD to participate in this study as a comparison group.

The study takes around 3 hours in total and you will be reimbursed for your time with \$30 worth of grocery vouchers.

If you are interested in taking part and you think that you do not have ADHD, please feel free to contact Mairin Taylor on 364-2987 ext.7191 or email: [mrt43@student.canterbury.ac.nz](mailto:mrt43@student.canterbury.ac.nz). This study has been given ethical approval by the Upper South B Regional Ethics Committee, Ministry of Health and the University of Canterbury Ethics Committee.

Department of Psychology  
University of Canterbury  
Private Bag 4800  
Christchurch

11<sup>th</sup> January 2007

Dear Participant:

I am conducting a research study within the Department of Psychology in which I am assessing adults with problems in attention and their health-risk behaviours. I understand that in the past you have participated in research conducted by my supervisor, Dr Julia Rucklidge and you gave permission to be contacted regarding future studies.

I have included an information sheet on my study which includes a description of the study (what you would be doing in the study, how much time it will take, how it might help you, and possible disadvantages of taking part), and ask that you please take the time to read over it and consider whether you would be interested in participating. I will attempt to follow up this letter with a phone call but if you have any questions or would like to make contact with me beforehand, please feel free to contact me via email or the phone number below. I really appreciate your time and look forward to talking with you.

Yours sincerely,

**Mairin Taylor**

Principle Investigator

Clinical Psychology Student and Doctoral  
Candidate

Department of Psychology

Ph: 364-2987 ext. 7191

Email: [mrt43@student.canterbury.ac.nz](mailto:mrt43@student.canterbury.ac.nz)

**Julia Rucklidge, Ph.D., C. Psych.**

Research Supervisor

Senior Lecturer and Registered

Senior Psychologist

Department of Psychology

Phone: 364-2987 ext. 7959

Department of Psychology  
University of Canterbury  
Private Bag 4800  
Christchurch

11<sup>th</sup> May 2007

Dear Managers,

I am a doctoral student currently enrolled at the University of Canterbury. I am undertaking research in the area of clinical psychology into the relationship between **adult Attention Deficit Hyperactivity Disorder (ADHD) and health risk taking**. I have completed two full years of postgraduate clinical psychology training and am under the supervision of Dr Julia Rucklidge, senior lecturer and clinical psychologist and Dr Roeline Kuijer, senior lecturer, University of Canterbury. The study has been granted ethical approval by both the Upper South Regional Ethics Committee (ref: URB/06/10/076) and the University of Canterbury Ethics Committee.

I am currently recruiting individuals to participate in this study. In particular, I am recruiting *adults over 18 years of age who have demonstrated long term attentional problems* that may indicate the presence of ADHD. Whether they have been diagnosed with ADHD in the past is not important as I will be assessing each participant for this disorder. I would be very grateful if you could refer any clients or other individuals that you think may benefit from an assessment of ADHD and may also be willing to participate in this study. I will complete a full psychometric and clinical assessment of ADHD. At the completion of their involvement, an assessment report will be sent to each referred participant (and with permission, each referrer). Feel free to pass on copies of the information sheet I have included to any appropriate clients.

In addition, I am seeking to compile a referral list of private practitioners who have some familiarity with adult ADHD. I would appreciate it if you would consider accepting referrals from this study for psychological treatment (in whatever form of treatment you are able to offer).

Please note that the **exclusion criteria for this study include a history of psychosis, significant brain injury, pervasive developmental disorder, high risk of harm to self or others and significant intellectual impairment.**

Please feel free to contact me for further information and to let me know if you are interested in working with me further. I appreciate the busy nature of your service. Thank you for taking time to consider this request.

Yours truly,

Mairin Taylor

Principle Researcher

PhD Candidate, Clinical Psychology  
Student

University of Canterbury

**Ph. 364 2987 ext. 7191**

**Email: [mrt43@student.canterbury.ac.nz](mailto:mrt43@student.canterbury.ac.nz)**

Julia Rucklidge, Ph.D., C. Psych.

Research Supervisor

Senior Lecturer and Registered Senior Psychologist

University of Canterbury

Phone: 364-2987 ext. 7959

**Appendix 3: Personal History Questionnaire:****HISTORY QUESTIONNAIRE**

Your name: \_\_\_\_\_  
 Date of birth: \_\_\_\_\_  
 Today's date: \_\_\_\_\_

*The purpose of this questionnaire is to obtain some background information about you. The information you provide is confidential and will only be used for research purposes.*

1. Please indicate which of the following ethnic groups you belong to (you may tick more than one).

- NZ European / Pakeha   
 NZ Maori   
 Samoan   
 Tongan   
 Niuean   
 Chinese   
 Indian   
 European   
 Other  (please specify) \_\_\_\_\_

2. Please indicate which of the following describes your current marital status:

- Married   
 De facto relationship   
 Single   
 Divorced   
 Widow   
 Other (please specify) \_\_\_\_\_

3. Please indicate all of the following statements that describe your home situation:

- I have dependent children who are living with me   
 I have children but they do not live with me   
 I live with others who aren't related to me (flatmates/ boarders)   
 I live in my parents home, supported by my parents

- I live alone
- I support my dependent parents or relatives who are living with me
- Other (please specify) \_\_\_\_\_

4. What is your occupation? \_\_\_\_\_

5. What is your partner's occupation (if applicable)? \_\_\_\_\_

6. Please indicate your highest educational qualification using the list below:

- No school qualifications
- 5<sup>th</sup> Form School certificate in one or more subjects (or level 1 NCEA)
- Sixth form certificate in one or more subjects (or NCEA level 2)
- University entrance in one or more subjects (or NCEA level 3)
- Post- secondary (e.g. diploma, trade certificate)
- NZ Undergraduate University degree
- NZ Postgraduate University degree
- Overseas University qualification  (please specify)
- Other qualification  (please specify)

7. Please indicate which of the following best describes your total yearly household income before tax (include income from all sources):

- Less than \$20,000
- \$20,000 to \$30,000
- \$30,000 to \$40,000
- \$40,000 to \$50,000
- \$50,000 to \$60,000
- \$60,000 to \$70,000
- More than \$70,000

Please write below any other important information about yourself that you think we should be aware of.

---

---

---

---

---

---

Thank you for completing the questionnaire

**Appendix 4: Adapted SLÁN Health and Lifestyle Questionnaire (Dept of Health and Children, Dublin, Republic of Ireland, 2002) (NB: adapted with permission from the authors).**

## SLÁN Health and Lifestyle Questionnaire

Name: \_\_\_\_\_

### **Section A: General Health Status**

This first section is all to do with your general health. Please tick.

**A1. In general, would you say your health is...**

Excellent [ ]    Very good [ ]    Good [ ]    Fair [ ]    Poor [ ]

**A2.**

**a) Thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?**

Number of Days \_\_\_\_\_    None [ ]

**b) Thinking about your mental health, which includes stress, depression and problems with emotions, for how many days during the past 30 days was your mental health not good?**

Number of Days \_\_\_\_\_    None [ ]

**c) During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work or recreation?**

Number of Days \_\_\_\_\_    None [ ]

**A3. Is your daily activity or the work limited by a long term illness, health problem or disability?**

Yes [ ]    No [ ]    Do not have any of the above [ ]

**A4. I think my own health would be better if I had...** (Please tick all that apply)

- |  |  |
|--|--|
| Change in my weight [ ]                  | Less time in smoky places [ ]                            |
| Regular checks from my family doctor [ ] | Someone to talk to [ ]                                   |
| Fewer changes in my life [ ]             | Better information about where to go for health care [ ] |
| Less stress [ ]                          | Easier to read health information [ ]                    |
| Employment [ ]                           | Better information about how to stay healthy [ ]         |
| More money [ ]                           | Less international/national pollution [ ]                |
| More willpower [ ]                       | Less local pollution (e.g. noise) [ ]                    |
| A different job [ ]                      | None of these [ ]  |
| Less alcohol [ ]                         |  |

**A5. Where do you get your information about health?** (Please tick all that apply)

- |  |                               |
|--|-------------------------------|
| General Practitioner (GP) [ ]                    | Health Organisations [ ]      |
| Other Health Professionals [ ]                   | Internet / World Wide Web [ ] |
| Health Promotion Service / Health Board [ ]      | Family / Friends [ ]          |
| Health Promotion Unit / Department of Health [ ] | Media [ ]                     |
|  | Other [ ]                     |

**A6. Which of the following do you think prevents people from improving their general health?** (Please tick all that apply)

- |                                  |   |
|----------------------------------|---|
| Feel no need [ ]                 | Lack of support from family/friends [ ]               |
| Lack of information [ ]          | Not being able to read and understand information [ ] |
| Financial problems [ ]           | Other, please specify _____                           |
| Lack of time [ ]                 |   |
| Lack of facilities/resources [ ] |   |

**A7. Your own health state today**

By placing a tick in one box in each group below, please indicate which statement best describes your own health state today.

**Mobility**

- I have no problems in walking about [ ]
- I have some problems in walking about [ ]
- I am confined to bed [ ]

**Usual activities**(e.g. work, study, housework, family or leisure activities)

- I have some problems with performing my usual activities [ ]
- I am unable to perform my usual activities [ ]
- I have no problems with performing my usual activities [ ]

**Pain/discomfort**

- I have extreme pain/discomfort [ ]
- I have no pain/discomfort [ ]
- I have moderate pain/discomfort [ ]

To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst sate you can imagine is 0.

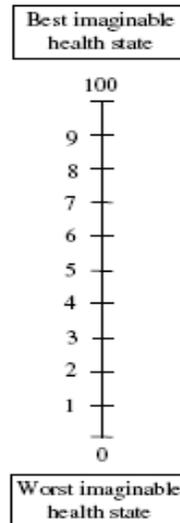
We would like you to indicate on this scale how good or bad your own health state is today, in your opinion. Please do this by drawing a line from the lower box to whichever point on the scale indicates how good or bad your health state is.

**Anxiety/depression**

- I am not anxious or depressed [ ]
- I am moderately anxious or depressed [ ]
- I am extremely anxious or depressed [ ]

**Self-care**

- I have no problems with self-care [ ]
- I have some problems with washing and dressing myself [ ]
- I am unable to wash and dress myself [ ]



**A8. How would you rate your quality of life?**

Very poor [ ]

Good [ ]

Poor [ ]

Very good [ ]

Neither poor nor good [ ]

**A9. How satisfied are you with your health?**

Very dissatisfied [ ]

Satisfied [ ]

Dissatisfied [ ]

Very satisfied [ ]

Neither satisfied nor dissatisfied [ ]

**A10. Have you ever attended an alternative/complementary practitioner?**

(e.g. acupuncturist, homoeopath, reflexologist)

Yes [ ]

No [ ]

If yes, what kind of practitioner did you attend?

\_\_\_\_\_

Which of the following did you attend for? (Please tick all that apply)

Aches and pains / muscle problems [ ]

Ear, nose and throat problems [ ]

Stress [ ]

Skin problems [ ]

To help give up smoking [ ]

Other, please specify [ ]

Weight loss [ ]

**A11. Adults can have up to 32 natural teeth. Which best describes you? (Please tick one box only)**

I have all my own teeth - none missing [ ]

I have dentures as well as some of my own teeth [ ]

I have my own teeth, no dentures - but some missing [ ]

I have full dentures [ ] Please go to A13

I have no teeth or dentures [ ] Please go to A13

**A12. How much toothpaste do you use?** (Please tick one box only)Amount to cover the entire brush  Peasized amount Amount to cover half the brush  None **A13. What is your weight without clothes?**

\_\_\_\_\_stones \_\_\_\_\_pounds (or \_\_\_\_\_kilos)

**A14. What is your height without shoes?**

\_\_\_\_\_feet \_\_\_\_\_inches (or \_\_\_\_\_cm)

**A15. When was the last time you had your blood pressure checked?**Up to 3 months ago  Up to 3 years ago Up to 6 months ago  Never Up to 1 year ago **A16. What is the level of your blood pressure?**High  Don't know Normal or Low **A17. When did you last have your blood cholesterol measured?**Up to 3 months ago  Up to 3 years ago Up to 6 months ago  Never Up to 1 year ago **A18. What is the level of your cholesterol?**High  Don't know Normal or Low **A19. Have you had a general health check up in the last 3 years?**Yes No

If yes, where did you go for your most recent check? (Tick one box only)

Your own doctor's surgery / health centre

A private medical company

A hospital

Your own place of work

Other, please specify \_\_\_\_\_

**A20. Are you attending any of the following for regular checks (e.g. once every three months) or treatment?** (Please tick all that apply)

Your own doctor's surgery / health centre

Mental Health Services (e.g. Counselling, outpatient clinic, therapy)

Your own place of work

Hospital

A private medical company

Other, please specify \_\_\_\_\_

**A21. Have you ever been told by a doctor that you have or have had any of the following?**

If yes, please tick all that apply.

Angina

Diabetes

Heart attack (coronary thrombosis, myocardial infarction)

High cholesterol

High blood pressure

Anxiety

Stroke

Depression

Other, please specify \_\_\_\_\_

**A22. Are you regularly taking any prescribed pills or medication?**

Yes  No

If yes, do you ever have any difficulties reading the instructions?

Yes  No

**A23. How do you think the following affect the risk of coronary heart disease and related diseases? (Please tick one box per line)**

	EFFECT ON RISK			
	Increases Risk a Lot	Increases Risk a Little	Doesn't Affect Risk	Don't Know
A Blood Pressure of greater than 130/85mmHg				
A Blood Pressure of greater than 140/90mmHg				
A Total Cholesterol Level greater than 5 mmol / litre				
A Total Cholesterol Level greater than 3 mmol / litre				
An LDL Cholesterol Level greater than 3 mmol / litre				
An LDL Cholesterol Level greater than 2 mmol / litre				
Smoking zero cigarettes per day				
Smoking between 1-5 cigarettes per day				

**A24. If you have been sexually active in the past twelve months, did you use contraception/protection?**

Not sexually active  If female please go to A26

If male please go to Section B

Always  Sometimes  Never

**A25. If you have used contraception or protection in the past twelve months, please indicate which methods you used most frequently (Please tick all that apply)**

Natural family planning

Coil/ IUD

Withdrawal

Spermicides only

Contraceptive pill

Condom

Cap/diaphragm

Other, please specify \_\_\_\_\_

**WOMEN ONLY:****A26. Are you pregnant now?**Yes []      No []**A27. Have you ever been on the contraceptive pill?**No []      Yes []

If yes, for how many years? \_\_\_\_\_years

**A28. Have you ever been advised to take Folic Acid supplements?**Yes []      No []**WOMEN WITH CHILDREN ONLY:****A29. Did you breast feed any of your children?**Yes []      No []    If no, go to question B1.**A30. Did you breast feed your last child?**Yes []      No []    If no, go to question B1.

If yes how long did you breast feed only for (Tick one box only)

less than 1 month []6 months or more []1-3 months []I breast and bottle fed my last child from the first month []4-6 months []**A31. Age at which child stopped any breast feeding \_\_\_\_\_months**

## Section B: Exercise

This section is all to do with your activity in your leisure time, around the house and at your job.

### LEISURE ACTIVITIES

**B1.** Considering a **7-day period** (a week), how many times on average do you do the following kinds of exercise for **more than 20 minutes during your free time?** (Please write the appropriate number on each line)

Times per Week

**a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY)**

(e.g. running, jogging, rugby, soccer, squash, basketball, judo, roller skating, vigorous swimming, vigorous long distance cycling, advanced aerobics)

\_\_\_\_\_

**b) MODERATE EXERCISE (NOT EXHAUSTING)**

(e.g. fast walking, tennis, badminton, easy swimming, easy cycling, popular and folk dancing, intermediate aerobics, heavy gardening)

\_\_\_\_\_

**c) MILD EXERCISE (MINIMAL EFFORT)**

(e.g. yoga, golf, easy walking, fishing from river bank, bowling, beginners aerobics, archery, light gardening)

\_\_\_\_\_

**d) LITTLE / NO ACTIVITIES**

\_\_\_\_\_

**B2.** How many days, if any, in an average week do you walk for 30 minutes or more?

\_\_\_\_\_ days

**B3. Do you attend a Gym / Leisure Centre?**Yes  No  If no, please go to B4

If yes, how often do you attend?

Every day  once a month   
 3- 4 times a week  less than once a month   
 once a week

If yes, what do you do there? (please tick all that apply)

Work with weights  Circuit training   
 Swimming  Exercise machines (e.g. stationary bike, rowing machine, running machine)   
 Aerobics (or step) classes   
 Other (please specify) \_\_\_\_\_

**HOUSEHOLD ACTIVITIES****B4. Do you do light household work?** (e.g. dusting, washing dishes, repairing clothes)

Seldom / Never  3-4 times per week   
 1-3 times per month  Most days   
 Once per week

**B5. Do you do heavy household work** (e.g. washing floors and windows, carrying rubbish bags, vacuuming/ hoovering)?

Seldom / Never  3-4 times per week   
 1-3 times per month  Most days   
 Once per week

**B6. If you go out shopping, what kind of transport do you usually use?**

Car  Public Transport   
 Walk  I never go out shopping   
 Bicycle

**PLEASE ANSWER THE FOLLOWING QUESTION IF CURRENTLY IN PAID EMPLOYMENT:**

**B7. Thinking about your job in general would you say that you are...**

Very physically active

Not very physically active

Fairly physically active

Not at all physically active

### **TIME SPENT SITTING**

The final questions are about the time spent sitting while at work, at home, whilst doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television.

**B8. During the last 7 days, how much time in total did you usually spend sitting on a week day?** \_\_\_\_\_hours \_\_\_\_\_minutes

**B9. During the last 7 days, how much time in total did you usually spend sitting on a weekend day?** \_\_\_\_\_hours \_\_\_\_\_minutes

**B10. How many hours per day do you spend watching television or playing computer games?**

Less than 1 hour

2-3 hours

Four hours or more

## **Section C: Accidents and Injuries**

This section is about injuries, how they happened and who treated them.

**C1. In the last 2 years have you had one or more injuries serious enough to interfere with your daily activities?**

Yes

No  If no go to question F6

**For the rest of this section please think about your most recent injury only**

**C2. Was your most recent injury mainly...**Accidental  Non-accidental **C3. Where did your most recent injury happen? (Please tick one box only)**

At home in the house  Playing sport   
 At home in the garden  On the road in a car or on a bike   
 At work  On foot on the road or pavement   
 Other (please specify)  \_\_\_\_\_

**C4. Which of the following caused your injury? (Please tick one box only)**

Hit, struck or bumped by a vehicle (e.g. car, motorbike, bicycle)  Being cut   
 Hit, struck or bumped by another person  An animal or insect bite   
 A burn or scald   
 A fall   
 Other (please specify)  \_\_\_\_\_

**C5. Who treated your injury? (Please tick one box only)**

Myself  Family / friends   
 Hospital - Accident and Emergency  Other   
 GP Service  Did not receive treatment   
 Hospital - Out patients

**C6. How often do you use seatbelts when you drive or ride in the front of a car?**

Always  Never   
 Nearly always  Don't know / Not sure   
 Sometimes  I never ride in the front of a car   
 Seldom  I never drive or ride in a car

**C7. How often do you use seatbelts when you drive or ride in the back of a car?**

Always  Sometimes   
 Nearly always  Seldom

Never I never ride in the back of a car Don't know / Not sure I never drive or ride in a car **C8. How often do you wear a helmet when you.....**

	Always	Often	Sometimes	Rarely or never	I do not ride bicycle/ motorbikes
Ride a bicycle	<input type="checkbox"/>				
Ride a motorbike	<input type="checkbox"/>				

**Section D: Food Habits**

This section is about your general eating habits.

**D1. Do you think what you eat could be healthier?**Yes  No **D2. Do you read food labels?**Yes  No 

If yes, which of the following do you look for on the label?

Ingredients Serving size Nutrients (e.g. Fat, Fibre, Sugar) Instructions for competitions Calorific Value Cooking instructions Weight of food Other, please specify Additives (e.g. E numbers) **D3. Do you follow any of the following diets? (Please tick all that apply)**Vegetarian Weight Reducing Vegan Low Cholesterol Diabetic Other Gluten Free Do not follow a special diet

**D4. Have you taken any vitamins, minerals or other food supplements during the past year?**

Yes  No

**D5. Have you taken folic acid tablets or multivitamins containing folic acid during the past year?**

Every day / Most days  Sometimes  Never

**D6. How often do you eat fried food?**

Daily  1-3 times a week

4-6 times a week  Less than once a week

**D7. How often do you eat the following spreads and fats? (Please tick one box on each line)**

	less than once a week	once a week or more but not most days	every/most days
Butter or hard margarine as a spread or for cooking food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A low-fat or polyunsaturated spread as a spread or in cooking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetable Oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lard or dripping in fried, roasted or baked foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**D8. What type of milk you use most often? (Please tick one only)**

Full fat  Buttermilk

Low fat  Dried

Skimmed/ Trim  Other

High Calcium  None

Soy

**D9. How much milk do you yourself drink each day (including milk in tea, coffee, cereals)?**

None  250 ml

1 pint (568ml) More than 1 litre 1 litre **D10. How often do you add salt to food while cooking?**Always Rarely Usually Never Sometimes **D11. How often do you add salt to food while at the table?**Always Rarely Usually Never Sometimes **D12. Generally how do you cook vegetables (excluding potatoes)? (Please tick one only)**Immersed in already boiling water for  
the minimum of time Fried Boiled from cold water Sautéed (e.g stirfry) Microwaved Sautéed then casseroled Grilled 

Other, Please specify \_\_\_\_\_

Steamed **D13. How often do you eat in (or eat food from) any of the following?**

	Hardly ever/ never	Less than once a month	Less than once a fortnight	Less than once a week	Once a week or more but not most days	Every/ most days
Very expensive restaurant (main course over \$25)						
Expensive restaurant (main course \$18 - \$25)						
Moderate restaurant (main course over \$10 - \$17)						
Inexpensive restaurant (main course under \$10)						
Cafe						
Fast food outlet/ Takeaways						
Work Canteen/ cafe						
Home delivery (e.g. pizza)						

**Appendix 5: The ART-Q: Adult Risk Taking Questionnaire****General Risk History Questionnaire**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Instructions:** Please answer the following questions by circling a letter below the question. Please answer as honestly as you can. Remember that your responses will be anonymous and treated confidentially. Please be sure to answer every question. Please note: **some** of the questions ask about the **time from when you turned 18** while other questions ask about different periods of time. Please read the questions carefully.

**The next 10 questions ask about personal safety.**

1. From the time you turned 18, **when you rode a bicycle**, how often did you wear a helmet?
  - A. I have not ridden a bicycle since turning 18
  - B. Never wore a helmet
  - C. Rarely wore a helmet
  - D. Sometimes wore a helmet
  - E. Most of the time wore a helmet
  - F. Always wore a helmet
  
2. From the time you turned 18, how often have you worn a seat belt when **riding in** a car driven by someone else?
  - A. Never
  - B. Rarely
  - C. Sometimes
  - D. Most of the time
  - E. Always
  
3. From the time you turned 18, how many times did you **ride** in a car or other vehicle **driven by someone who had been drinking alcohol (they were intoxicated or drunk)**?
  - A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times

- G. 10 or 11 times
  - H. 12 or more times
4. From the time you turned 18, how many times did you **drive** a car or other vehicle **when you had been drinking alcohol**?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times
  - G. 10 or 11 times
  - H. 12 or more times
5. From the time you turned 18, how many times have you **lost consciousness** (blacked out) after accidentally hitting your head?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times
  - G. 10 or 11 times
  - H. 12 or more times
6. From the time you turned 18, have you been told you have ongoing problems as a result of an accidental brain/ head injury?
- A. No, I have never had a brain injury
  - B. Yes
  - C. No
7. From the time you turned 18, have you ever been hit by a car or other vehicle while crossing a road as a pedestrian?
- A. Yes
  - B. No
8. From the time you turned 18, how many car accidents have you been in where you were the driver?
- A. I don't drive
  - B. 0 times
  - C. 1 time
  - D. 2 or 3 times
  - E. 4 or 5 times
  - F. 6 or 7 times
  - G. 8 or 9 times
  - H. 10 or more times

9. From the time you turned 18, how often do you text message on a mobile phone while you are driving a car (before the law change)?
- A. I don't drive
  - B. I don't have a mobile phone
  - C. Never
  - D. Rarely
  - E. Sometimes
  - F. Most of the time
  - G. Always
10. From the time you turned 18, how many times have you walked through the central city alone, between the hours of 11pm and 6am?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times
  - G. 10 or 11 times
  - H. 12 or more times

**The next 4 questions ask about violence-related behaviors.**

11. From the time you turned 18, on how many occasions did you carry **a weapon** such as a gun, knife, or club?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times
  - G. 10 or 11 times
  - H. 12 or more times
12. From the time you turned 18, how many times were you in a physical fight?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times

- G. 10 or 11 times
- H. 12 or more times

13. From the time you turned 18, has a boyfriend, girlfriend, spouse or partner ever hit, slap, or physically hurt you on purpose?
- A. Yes
  - B. No
14. From the time you turned 18, have you ever been physically forced to have sexual intercourse when you did not want to?
- A. Yes
  - B. No

**The next 4 questions ask about tobacco use.**

15. **Have you ever** tried cigarette smoking, even one or two puffs?
- A. Yes
  - B. No **–If no, please go to Question 20.**
16. **How old were you** when you smoked a **whole** cigarette for the first time?
- A. I have never smoked a whole cigarette
  - B. 8 years old or younger
  - C. 9 or 10 years old
  - D. 11 or 12 years old
  - E. 13 or 14 years old
  - F. 15 or 16 years old
  - G. 17 years old or older
17. **Have you ever** smoked cigarettes daily, that is, at least one cigarette every day for 30days?
- A. Yes
  - B. No
18. From the time you turned 18, how many times did you try **to quit** smoking cigarettes?
- A. I have not smoked since turning 18
  - B. 0 times
  - C. 1 time
  - D. 2 or 3 times
  - E. 4 or 5 times
  - F. 6 or 7 times
  - G. 8 or 9 times
  - H. 10 or more times

**The next 5 questions ask about drinking alcohol. This includes drinking beer, wine, RTD's (Ready to Drink), and liquor such as rum, gin, vodka, or whiskey.**

19. **How old were you** when you had your first drink of alcohol other than a few sips?
- A. I have never had a drink of alcohol other than a few sips (skip to Question 24)
  - B. 8 years old or younger
  - C. 9 or 10 years old
  - D. 11 or 12 years old
  - E. 13 or 14 years old
  - F. 15 or 16 years old
  - G. 17 years old or older
20. **During the past 30 days**, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?
- A. 0 days
  - B. 1 day
  - C. 2 days
  - D. 3 to 5 days
  - E. 6 to 9 days
  - F. 10 to 19 days
  - G. 20 or more days
21. From the time you turned 18, how many times have you accidentally injured yourself as a direct result of being intoxicated/ drunk?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times
  - G. 10 or more times
22. From the time you turned 18, how many times have you blacked out as a direct result of being intoxicated/ drunk?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times

- F. 8 or 9 times
  - G. 10 or more times
23. From the time you turned 18, how many times have you required hospitalization as a direct result of being intoxicated/ drunk (alcohol poisoning)?
- A. 0 times
  - B. 1 time
  - C. 2 or 3 times
  - D. 4 or 5 times
  - E. 6 or 7 times
  - F. 8 or 9 times
  - G. 10 or more times

**The next 11 questions ask about marijuana and other drug use.**

24. **How old were you** when you tried marijuana for the first time?
- A. I have never tried marijuana (skip to Question 27)
  - B. 8 years old or younger
  - C. 9 or 10 years old
  - D. 11 or 12 years old
  - E. 13 or 14 years old
  - F. 15 or 16 years old
  - G. 17 years old or older
25. **During the past 30 days**, how many times did you use marijuana?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 to 59 times
  - G. 60 to 79 times
  - H. 80 or more times
26. From the time you turned 18, have you been told that you have psychological problems as a result of regular use of marijuana?
- A. Yes
  - B. No
27. **During the past 30 days**, how many times did you use **any** form of cocaine, including powder, crack, or freebase?

- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 to 59 times
  - G. 60 to 79 times
  - H. 80 or more times
28. From the time you turned 18, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 or more times
29. From the time you turned 18, how many times have you used **heroin**?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 or more times
30. From the time you turned 18, how many times have you used **methamphetamines** (also called meth, speed, crystal, ice or P)?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 or more times
31. From the time you turned 18, how many times have you used **ecstasy** (also called MDMA)?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times

- F. 40 or more times
32. From the time you turned 18, how many times have you taken **steroid** pills or shots without a doctor's prescription?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 or more times
33. From the time you turned 18, how many times have you used a needle to inject any **illegal** drug into your body?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 or more times
34. From the time you turned 18, how many times have you injected illegal drugs using a needle that you didn't think was clean (sterile)?
- A. 0 times
  - B. 1 or 2 times
  - C. 3 to 9 times
  - D. 10 to 19 times
  - E. 20 to 39 times
  - F. 40 or more times

**The next 15 questions ask about sexual behavior.**

35. Have you ever had sexual intercourse?
- A. Yes
  - B. No -If no, please go to the end of the questionnaire.**
36. How old were you when you had sexual intercourse for the first time?
- A. I have never had sexual intercourse
  - B. 11 years old or younger
  - C. 12 years old
  - D. 13 years old

- E. 14 years old
  - F. 15 years old
  - G. 16 years old
  - H. 17 years old or older
37. From the time you turned 18, approximately how many people have you had sexual intercourse with?
- A. I have never had sexual intercourse
  - B. 1 person
  - C. 2-5 people
  - D. 6- 10 people
  - E. 11-20 people
  - F. 21-30 people
  - G. 31-40 people
  - H. 41-60 people
  - I. More than 60 people
38. From the time you turned 18, how often did you drink alcohol or use drugs before you had sexual intercourse?
- A. Never
  - B. Rarely
  - C. Sometimes
  - D. Most of the time
  - E. Always
39. From the time you turned 18, have you had unprotected sex (without a condom) with someone who wasn't a long-term partner?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
40. From the time you turned 18, have you ever had sex with someone even though you thought they were not a safe partner because of STD's (sexually transmitted diseases)?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
41. From the time you turned 18, have you had sex with a partner who has used IV drugs?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No

42. From the time you turned 18, have you had sex in exchange for money, drugs or a place to stay?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
43. From the time you turned 18, have you had sex with a partner you have known for less than a day?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
44. From the time you turned 18, have you suffered accidental injury or loss of consciousness as a result of engaging in BDSM (Bondage and Discipline/ Sadism/ Masochism)
- A. I have never engaged in BDSM
  - B. Yes
  - C. No
45. From the time you turned 18, have you ever had anal sex without a condom?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
46. From the time you turned 18, have you had sex someone even though you had asked them to be tested for the HIV/AIDS virus and they refused?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
47. From the time you turned 18, have you been tested for the HIV/AIDS virus?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No
48. From the time you turned 18, have you ever had any sexually transmitted diseases (STDs)?
- A. I have never had sexual intercourse
  - B. Yes
  - C. No

49. Which STDs have you had in since turning 18 (write number if occurred more than once)?
- A. Gonorrhoea
  - B. Syphilis
  - C. Hepatitis
  - D. Chlamydia
  - E. Crabs/pubic lice
  - F. Herpes
  - G. Genital warts
  - H. Other (please list)\_\_\_\_\_

**This is the end of the questionnaire. Thank you for taking the time to complete it. Please let the researcher know if there are any issues you would like to discuss further.**