Irritability: An investigation of prevalence and clinical correlates in adolescence and adulthood

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General Declaration

In accordance with Monash University Doctorate Regulation 17 Doctor of Philosophy and Research Master's regulations the following declarations are made:

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes three unpublished publications. The core theme of the thesis is the relationship that irritability has with other psychological symptoms and how that relationship differs between adults and adolescents. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the candidate, working within the Centre for Development Psychiatry and Psychology, School of Psychology and Psychiatry under the supervision of Dr. Glenn Melvin and Emeritus Professor Bruce Tonge.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

In the case of Chapters 4, 5, and 6 my contribution to the work involved the following:

Thesis chapter	Publication title	Publication status*	Nature and extent of candidate's contribution
Chapter 4, Paper 1	Psychometric properties of the Affective Reactivity Index in Australian adults and adolescents	Under review	Reviewed literature; designed study, secured ethics; collected, coded and statistically analysed data; prepared paper. 80%
Chapter 5, Paper 2	Irritability and psychopathology: A comparison between adults and adolescents	submitted	Reviewed literature; designed study, secured ethics; collected, coded and statistically analysed data; prepared paper. 80%
Chapter 6, Paper 3	Can irritability act as a marker of psychopathology?	Under review	Reviewed literature; designed study, secured ethics; collected, coded and statistically analysed data; prepared paper. 80%

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Abstract

Irritability is a mood that most people experience as part of a normal, healthy life. It is also a symptom or associated feature of a number of psychological disorders. There is a general belief that adolescents experience irritability to a greater degree than other age groups and high levels of irritability during adolescence are independently predictive of suicide risk and the development of internalising disorders. Irritability research has however been hampered by a lack of appropriate measures, to address this issue Stringaris et al. (2012) created the Affective Reactivity Index which has been shown to be a reliable and valid measure of irritability in adolescents in both the US and UK. Irritability is a psychological symptom that is thought to be developmentally sensitive. For example, in the DSM-5 irritability is a symptom of depressive disorders for children and adolescents but not for adults. Yet little research has been conducted examining the developmental trajectory of irritability, and no peer reviewed publications were found that compared irritability in the context of depressive disorders or other depressive symptoms between adolescence and adulthood.

The present thesis, prepared as a thesis by publication, aimed to determine whether the ARI was a psychometrically sound tool for use with Australian adults and adolescents. The thesis used the ARI to investigate the associations irritability has with mental health problems, as well as any differences in irritability or its associations with mental health problems between adults and adolescents.

The first paper entitled ‘Psychometric properties of the Affective Reactivity Index in Australian adults and adolescents’ has been resubmitted to *Psychological Assessment* after reviewer’s comments were addressed. This paper reports that the ARI is a reliable measure in both Australian adults ($\alpha = 0.80$) and adolescents ($\alpha = 0.85$). The measure conforms to the

single factor structure proposed by Stringaris et al. (2012), although there may be some item redundancy. The validation analyses are promising with moderate correlations between the ARI and measures of psychopathology, demonstrating convergent validity.

The second paper entitled 'Irritability and psychopathology: A comparison between adolescents and adults' has been submitted to *The Australian and New Zealand Journal of Psychiatry*. This paper directly compares the level of irritability and the association irritability has with depressive symptoms between adolescents and adults. Adults had higher mean irritability scores than adolescents and also higher mean depressive symptom scores. Adults who reported they experienced impairment due to their irritability were more likely to score above the clinical cut off on measures of depression and anxiety. Irritability was strongly associated with depressive symptoms in both adults and adolescents, and with anxiety symptoms in adults. The results reported in this paper indicate that the belief that adolescents are more irritable than adults may not be true, though adolescents may be more prone to experiencing impairing irritability in the absence of categorical mental health disorders than adults. Additionally there was little difference in the level of association between irritability and depressive symptoms between adolescents and adults indicating the need for further research to determine if irritability is also a salient feature of adult depressive disorders.

The third paper entitled 'Can irritability act as a marker of psychopathology?' is under review by *Journal of Adolescence*. This paper examines how irritability differs between a community sample of adolescents and a clinical sample of adolescents diagnosed with psychological disorders. As expected the clinical sample reported significantly higher mean irritability scores than the community sample. The clinical sample also had a greater degree of impairment associated with their irritability than the community sample. A receiver operating characteristic (ROC) analysis found that according to self report a score of 4 on the

ARI was the optimum cut off point for distinguishing between those with and without a DSM-IV diagnosis. This value resulted in an area under the curve of 0.86 (95% CI 0.76 to 0.95) with a sensitivity of 77.4% and a specificity of 77.4%. The data reported in this paper demonstrates that irritability is strongly associated with mental health problems in adolescents and due to this it may be possible to use the ARI as a screen for psychological disorder.

The results presented in this thesis call into question the widely held belief that adolescents are more irritable than adults. However, the adult sample comprised mostly young adults so any conclusions drawn can only be made in terms of young adults. The results presented here also provide initial evidence that the relationship between irritability and depression may continue into adulthood. These results cannot be extrapolated to the entirety of adulthood but for young adults at least, irritability may continue to be a relevant symptom of depressive disorders.

Chapter 1

Introduction

Irritability is ubiquitous in psychopathology yet has received limited research attention. This thesis examines the prevalence and clinical correlates of irritability in adults and adolescents. The thesis has been prepared as a thesis by publication with the findings being presented in three papers submitted for publication in peer-reviewed journals. As such there will be unavoidable repetition of material though efforts have been made to keep this to a minimum. This chapter will give a brief history of how irritability has been conceptualised and the important role that it plays in psychopathology before presenting an outline of the thesis.

Background

Born and Steiner (1999) review the history of irritability and discuss how the term has been around for centuries, though how it is conceptualised has differed greatly. In Claudius Galen's work on the relationship between temperament and bodily humours, an abundance of yellow bile was associated with a choleric, or irritable, state. Over the next 1500 years irritability continued to be associated with physiological symptoms, however it also began to be conceptualised as a marker of disease. At the beginning of the 20th century Emil Kraepelin (Diefendorf; Kraepelin, 1907) introduced the concept of irritability as a psychological symptom in the context of manic-depression rather than the transient physiological state proposed by Galen.

The first modern definition of irritability was published by Buss and Durkhee (1957) who conceptualised irritability as an aspect of hostility defined as 'a readiness to explode with negative affect at the slightest provocation. This includes quick temper, grouchiness,

exasperation, and rudeness' (p. 343). The next development in the conceptualisation of irritability came in the 1970s with the development of a scale to measure irritability as a unique construct alongside depressive and anxiety symptoms (Snaith, Constantopoulos, Jardine, & McGuffin, 1978). Snaith and Taylor (1985) defined irritability as 'a feeling state characterised by reduced control over temper which usually results in irascible verbal or behavioural outbursts, although the mood may be present without observed manifestation' (p. 128). These authors posited that severe irritability alone may constitute a mood disorder and not simply be symptomatic of other psychiatric conditions such as depressive or anxiety disorders. Until very recently however, this view has not been widely adopted. In the past decade there has been considerable research into a psychiatric condition termed severe mood dysregulation (SMD) which is characterised by extreme, chronic irritability and hyperarousal symptoms. The DSM-5 taskforce decided to include a modified version of SMD in the new manual (American Psychiatric Association, 2012a). The new disorder is called Disruptive Mood Dysregulation Disorder (DMDD) and is based on SMD but without the hyperarousal symptoms (APA, 2013). The definition of irritability provided by one of the leading researchers contributing to the recent literature regarding irritability of 'easy annoyance and touchiness, [that] is characterised by the emotion of anger, and temper outbursts can be its behavioural manifestation' (Stringaris, 2011, p. 61) is the definition used in this thesis.

The inclusion of an irritable mood disorder in DSM-5 highlights the important role that irritability plays in mental health. Prevalence studies have found between 3.3% and 23.9% of children and adolescents report experiencing severe irritability (Brotman et al., 2006; Pickles et al., 2010; Sund, Larsson, & Wichstrøm, 2001). The variation is likely due to how irritability was measured, i.e. Brotman et al. (2006) measured prevalence rates of SMD (3.3%), Pickles et al. (2010) used diagnostic interviews to ascertain irritability prevalence (23.9%) and Sund et al. (2001) used a single item on the Mood and Feelings Questionnaire

(11.9%). High levels of irritability during adolescence, as well as being cross-sectionally associated with internalising and externalising disorders (Brotman et al., 2006; Stringaris & Goodman, 2009), were independently predictive of suicide (Pickles et al., 2010) and the development of internalising disorders (Brotman et al., 2006; Leibenluft, Cohen, Gorrindo, Brook, & Pine, 2006; Stringaris, Cohen, Pine, & Leibenluft, 2009).

In DSM-5 irritability is ubiquitous (APA, 2013). It is included in the diagnostic criteria for antisocial personality disorder, borderline personality disorder, bipolar disorder, generalised anxiety disorder, oppositional defiant disorder, intermittent explosive disorder, and posttraumatic stress disorder. It is included as an associated feature of attention deficit hyperactivity disorder, and conduct disorder. Irritability is also included in the diagnostic criteria for child and adolescent, but not adult, depressive disorders. There is strong support for irritability being included as a criterion for child and adolescent depressive disorders (Crowe, Ward, Dunnachie, & Roberts, 2006; Masi, Favilla, Mucci, Poli, & Romano, 2001; Stewart et al., 2002). Research also suggests that irritability may be of importance to adult depressive disorders. For example in the STAR*D study of the treatment of major depressive disorder it was found that 80% of depressed adults reported experiencing some irritability (Perlis et al., 2005) and 46% reported experiencing irritability at least half the time in the preceding week (Perlis et al., 2009). Though DSM-5 (APA, 2013) offers no explanation as to why irritability is included in child and adolescent depressive disorders but not adult depressive disorders.

As is highlighted by DSM-5's inclusion of irritability in child and adolescent, but not adult, depressive disorders, irritability is considered a developmentally sensitive mood. Despite this there has been very little research investigating the developmental trajectory of irritability. A review of the literature was only able to identify four peer reviewed articles (Al Jurdi et al., 2012; Fichter, Kohlboeck, Quadflieg, Wyschkon, & Esser, 2009; Leibenluft et al.,

2006; Perlis et al., 2005) that mention how irritability changes, or stays the same, over time. Only one of these articles (Fichter et al., 2009) investigated irritability in the transition from adolescence to adulthood, finding that irritability decreased with age. Given the importance of irritability to mental health there is a need for further research investigating its development across the lifespan, particularly in the context of depressive disorders. This thesis begins to address this gap in the literature by comparing irritability and depressive symptoms between a cross-sectional sample of adolescents and adults.

Key Chapters and Papers

The remainder of the thesis proceeds as follows:

Chapter 2 – A review of the literature concerning irritability in adults and adolescents

This chapter explores in detail the research that has been conducted investigating irritability and identifies gaps in the literature. The chapter concludes with the aims and hypotheses of the thesis.

Chapter 3 – Methodology

This chapter provides detailed information about the methodology employed in the undertaking of this research. The methodology chapter allows for a greater depth of discussion and more information to be provided than is generally accepted in journal articles.

Chapter 4 – Paper 1: Psychometric properties of the Affective Reactivity Index in Australian adults and adolescents

This chapter provides evidence as to the psychometric properties of the ARI, addressing the first aim of the thesis. This is important to the overall thesis as it needed to be

established whether the ARI was actually appropriate for use with adults in order to address the remaining aims of the thesis.

Chapter 5 – Paper 2: Irritability and psychopathology: A comparison between adults and adolescents

This chapter is a direct comparison of irritability and its clinical correlates between adults and adolescents and presents some of the most significant findings of the thesis.

Chapter 6 – Paper 3: Can irritability act as a marker of psychopathology?

This chapter compares the level of irritability and its clinical correlates between a community sample of adolescents and a sample of psychiatrically unwell adolescents. This chapter also contains a receiver operating characteristic (ROC) analysis examining the ability of the ARI to distinguish between those with and those without a DSM-IV diagnosis.

Chapter 7 – General discussion

This chapter discusses the findings and implications of the results in greater depth than is generally accepted in journals. It also integrates and discusses the three papers contextualising each one in the overall thesis. This chapter discusses the limitations of the research and provides several suggestions for future research before concluding the thesis with a discussion of the implications of the findings.

Chapter 2

A review of the literature concerning irritability in adults and adolescents

The main aim of this chapter is to provide a comprehensive discussion of the literature regarding irritability. The chapter discusses at length the conceptualisation of irritability and research regarding the phenomenology of irritability both within community and psychiatric samples. It then discusses several ways in which irritability has been assessed over the past 60 years before outlining the limited research that has been conducted into the treatment of irritability. The chapter concludes by identifying major gaps in the literature, some of which are addressed in this thesis and some of which are beyond the scope of the current work.

A review of the literature concerning irritability in adults and adolescents

2.1 Defining irritability

The majority of people, at some point, will experience irritability. Irritability is also a symptom of a wide range of psychiatric disorders, both internalising and externalising (APA, 2013). In fact it is present in so many psychopathological conditions that it has been referred to as 'analogous to fever or pain: it provides a sensitive indication that something is wrong, but it is not specific to any particular condition' (Kowatch, Youngstrom, Danielyan, & Findling, 2005, p. 493).

One of the first modern attempts to define the term irritability was made by Buss and Durkhee (1957) who defined irritability as a subclass of hostility that was 'a readiness to explode with negative affect at the slightest provocation, including quick temper, grouchiness, exasperation, and rudeness' (p. 343). Snaith and Taylor (1985) extended this definition and described irritability as 'a feeling state characterized by reduced control over temper which usually results in irascible verbal or behavioural outbursts, although the mood may be present without observed manifestation' (p.128). Most definitions provided in the literature only address one or two aspects of this complicated concept. Snaith and Taylor, who have provided arguably the most comprehensive definition that includes feelings and behaviours fail to mention cognitions or the role that a provoking stimulus may play. When reviewing the literature Snaith, Constantopoulos, Jardine, and McGruffin (1978) discuss a definition of hostility in which irritability is a component. This definition (Gottschalk, Gleser, & Springer, 1963) states that hostility directed towards the self, or inwardly, should be distinguished from hostility directed externally. Snaith et al. (1978) adopted the idea that irritability can be directed inward or outward and included these as subscales in the measure

they developed, the "Irritability, Depression, and Anxiety Scale". The items used to measure 'outward directed irritability' appear to be measuring behavioural aspects of irritability. The items used to measure 'inward directed irritability' appear to be measuring an internal irritable mood as well as thoughts about self harm.

While both main international classification systems of psychopathology, the DSM-5 (APA, 2013) and the International Classification of Disease version 10 (ICD-10: World Health Organization, 1994) include irritability as a symptom of a range of disorders they fail to provide an adequate definition. ICD-10 provides no definition for the symptom and the definition provided by DSM-5 of irritable mood is 'easily annoyed or provoked to anger' (p.825). This lack of definitional clarity extends to the broad psychological literature where irritability has many definitions. Some of these definitions refer to behaviours associated with irritability, while others focus on feelings and thoughts.

Recently Stringaris (2011) has discussed some of the issues surrounding the concept of irritability with a particular focus on its position in DSM-5. He defines irritability as 'easy annoyance and touchiness, [that] is characterised by the emotion of anger, and temper outbursts can be its behavioural manifestation' (p.61). Stringaris discusses the problems that can arise in conceptualising irritability given the way it is presented in DSM currently. Irritability is a mood but Stringaris argues that its inclusion as a symptom of disruptive behavioural disorders such as ODD can lead to a confusion between precedents (irritable mood) and outcomes (disruptive behaviour). It is possible that the inclusion of irritability in such a range of disorders can lead to artificial co-morbidity. Thus Stringaris suggests that irritability perhaps be conceived of as a dimension that cuts across psychopathology and thus can be present or absent in any diagnosis. This idea has been supported in the DSM-5 which incorporates a number of cross-cutting symptoms, including irritability (APA, 2013).

Mood dysregulation and mood lability are concepts that are important to consider in relation to irritability. Mood dysregulation refers to the inability to properly regulate moods and is a common feature of mood disorders such as bipolar disorder. Irritability could be a consequence of not being able to regulate one's mood in a functional manner. Mood lability refers to frequent, rapid, or extreme changes in mood and has been linked to both internalising and externalising disorders (Stringaris & Goodman, 2009c). It has been proposed that irritability may be a component of mood lability (Stringaris & Goodman, 2009c).

One of the issues complicating the definition of irritability in the psychological literature is that the term irritability is often used interchangeably with other terms such as anger, hostility, and aggression to describe a constellation of feelings, thoughts and behaviours associated with negative reactions to aversive stimuli. This review will define each of the related terms, anger, aggression, and hostility, and highlight how they differ from irritability. Berkowitz (1993) proposed a network of emotions to explain why some feelings, such as anger and irritability, occur so often together that they become synonymous in everyday speech. He theorises that one experience of an emotion triggers a range of associated memories and other emotions that can result in an individual experiencing a variety of emotions. The strength of the association between emotions will determine whether they activate together. Anger, irritability, hostility, and aggression often occur together and are hard to differentiate. Each of these terms, though they may be closely related, refer to different aspects of negative emotions and as such should not be used interchangeably.

Anger is a concept that is difficult to define; it is a negative emotion that is typically defined with some reference to the accompanying physiological responses such as facial expression (Berkowitz, 1993), and increased blood pressure (Potegal & Stemmler, 2010). Anger is often directed at an object or individual external to the person (Berkowitz, 1993) and

is characterised by related emotional states. Anger can be conceived of as existing on a continuum, with low levels of negative emotions including frustration and irritation through to more extreme negative feelings of anger and rage. Irritability thus can be distinguished from anger in that anger is a strong emotion associated with observable physiological changes that is usually directed at something while irritable mood is an internal general state of unpleasant feelings accompanied by a lowered threshold of tolerance for stimuli. Irritability is closely related to anger as once a person who is irritable is presented with an environmental provocation or a noxious stimulus or 'target' they can quickly become angry. Hostility can be defined as the long term storage of ill feelings, beliefs, and desires for vengeance (Caprara, Paciello, Gerbino, & Cugini, 2007). Yang, Huang, Lin, Tsai, and Hua (2011) discuss how irritability and hostility differ as irritability is associated with a lowered frustration tolerance and hostility is due to negative evaluations of external stimuli. Thus they argue that hostility represents the cognitive part of a subjective negative feeling, while irritability may represent the emotional part.

Aggression can be defined as the intention to cause harm toward others either physically or psychologically (Berkowitz, 1993). There are two common types of aggression: instrumental aggression and emotional aggression. Instrumental aggression occurs when the aggression itself is not the end goal but merely a means to attain a desired outcome (e.g. threatening a person for financial gain), this type of aggression is not particularly relevant to the concept of irritability. Emotional aggression occurs when an individual is in a negative emotional state and the goal of the aggression is to cause harm to another person (e.g. road rage) (Berkowitz, 1993). This differs from irritability as being irritable does not necessarily lead to wishing harm to others. The concepts are related however, as increased irritability can lead to overt displays of aggression (Caprara et al., 2007; Choynowski, 1995; Giancola, 2002; Godlaski & Giancola, 2009; Stanford, Greve, & Dickens Jr., 1995). Emotional aggression

overlaps substantially with impulsive aggression (Coccaro, Bergeman, Kavoussi, & Ceroczynski, 1997) and strong associations have been found between irritability and impulsive aggression (Coccaro et al., 1997; Stanford et al., 1995). Stanford et al. (1995) argue that irritability and impulsivity are both involved in behaviour regulation and as such those individuals who are both highly irritable and highly impulsive are much more likely to become aggressive.

Supporting the idea that irritability and aggression are related but distinct concepts is the work of Giancola (2002) and Godlaski and Giancola (2009). This research focussed on the relationship between irritability and alcohol related aggression. The results of the placebo controlled study indicated that irritable people under the influence of alcohol are more aggressive (Giancola, 2002). There was also an irritability/gender/alcohol interaction indicating that highly irritable men who consumed alcohol were much more aggressive than any other group. Alcohol had no effect on the aggressiveness of those who scored low on irritability. Godlaski and Giancola (2009) furthered this research by adding the variable of executive functioning to the study. It was theorised that alcohol causes problems with executive functioning that results in increased irritability in response to provocation, leading to higher levels of aggressive behaviour. Irritability was found to mediate the relationship between executive functioning and aggression for intoxicated men, but not intoxicated women. Those participants who received a placebo rather than alcohol similarly showed no mediation effects. The strongest predictor of aggression was irritability, followed by gender, executive functioning, and beverage type.

This research has shown irritability, hostility, and aggression to be related but distinct concepts, supporting the argument for more research into irritability as a standalone concept rather than irritability as a component of hostility or aggression. As will be demonstrated in section 2.4, the assessment of irritability has progressed from its inclusion as a subscale

within tools measuring other concepts, such as hostility, to a phenomenon investigated in its own right.

2.2 Irritability in normal populations

As well as being a psychiatric symptom, irritability is a normal mood experienced by most people. There has however, been a limited amount of research conducted on irritability particularly in the general population. Research in Norway found that in a large sample of 13-14 year olds, 43.8% reported feeling irritable for some of the past two weeks, while a further 11.9% reported feeling irritable for most of the past two weeks (Sund, Larsson, & Wichstrøm, 2001). The high incidence of mild irritability could be a reflection of the normal experience of adolescence while the experience of feeling irritable most of the time might be a more pathological form. High levels of irritability during adolescence in community samples predict low income and poor educational attainment up to twenty years later (Stringaris, Cohen, Pine, & Leibenluft, 2009).

Irritability in typical populations has been related to demographic variables, gender and age in particular. A longitudinal study by Leibenluft et al. (2006) investigated the incidence of irritability in a sample of adolescents ($N = 776$) over the course of nine years. A significant gender difference was found, with females reporting higher levels of both chronic ($\beta = -0.31$, $p < 0.04$) and episodic irritability ($\beta = -0.26$, $p < 0.01$). Women suffer from disorders such as premenstrual syndrome and premenstrual dysphoric disorder for which irritability is the hallmark symptom (Claman & Miller, 2006) and are more likely to experience internalising disorders (Kessler, 2000, 2003). This might in part account for the increase in the incidence of episodic irritability in the sample of women studied by Leibenluft et al. However, irritability is also a symptom of externalising disorders which are more common in males than females (APA, 2013). Thus one might expect males to have higher levels of chronic irritability. Leibenluft et al.'s finding that females also had higher levels of chronic irritability

suggests that women may either be more prone to irritability and/or are more likely to report it. However, other studies have found no relationship between gender and irritability (Fichter, Kohlboeck, Quadflieg, Wyschkon, & Esser, 2009; Stringaris et al., 2012).

Irritability is considered to be more prevalent in youths than in adults. Buchanan, Eccles, and Becker (1992) observe that it is a widely held belief that a typically developing person is more irritable during adolescence than at any other stage of their lives. In Leibenluft et al.'s (2006) study episodic irritability had a linear relationship with age, as people aged their irritability increased. Chronic irritability on the other hand, had a quadratic relationship with age so that it increased in early adolescence, peaking around ages 14-16, and then began to decline in late adolescence.

The quadratic relationship of irritability and age found by Leibenluft et al. (2006) suggests there is a peak in irritability during mid-adolescence but provides no indication as to whether irritability continues to decline into adulthood. The research of Fichter et al. (2009) supports the idea that irritability declines from childhood and adolescence into adulthood. Irritability was assessed in a sample of 269 children and adolescents, and at an 18 year follow up irritability levels had significantly decreased. In accordance with this argument it has been suggested that irritability is linked to some degree to hormonal activity, in particular testosterone and oestradiol (Buchanan et al., 1992). Testosterone and oestradiol are associated with heightened responses to stimuli. Thus changing hormone levels (including testosterone and oestradiol) experienced throughout puberty may result in adolescents becoming far more irritable when confronted with challenging or noxious stimuli than children or adults would (Buchanan et al., 1992).

Serotonin dysfunction is an important feature of mood dysregulation, and it has been implicated in irritability (Steiner, Lepage, & Dunn, 1997). Increased levels of the serotonin

metabolite 5-hydroxyindolacetic acid have been associated with elevated irritability scores in adults (Nilsson et al., 2010). Serotonin plays an important role in mood regulation and disorders and is associated with the hormonal changes that accompany menarche in women. Consequently, Steiner et al. (1997) argue that menarche should be considered as an important factor when investigating serotonin dysfunction, which may lead to mood disorders, in vulnerable women. Thus whether or not a girl has reached menarche is a factor researchers may need to take into account when investigating irritability in female adolescents. It is important however, not to only focus on the effects of hormones on irritability in females. A strong relationship between testosterone and externalising behaviour has been demonstrated in adolescent males (Maras et al., 2003). Gerra et al. (1996) found in a sample of healthy men a strong relationship between testosterone level and irritability as measured by the irritability subscale of the Buss Durkhee Hostility Inventory. Thus individual hormone levels and fluctuations may influence the level of irritability experienced by both males and females.

Context is another important factor to take into account when evaluating whether an individual is irritable. A person may be extremely irritable in some situations but not at all irritable in others. Weissman, Klerman and Paykel (1974) asked a group of depressed women about their irritability and the situations in which they were irritable. The level of irritability the women reported varied depending on the intimacy of their relationship with others. Women were least irritable with their work colleagues and most irritable with their spouses and children. If one extrapolated this research to other age groups one could surmise that children and young adolescents would be most irritable in the home environment with their parents and siblings while older adolescents may have formed intimate attachments outside the family and might experience irritability with their lover for example.

Research is required to establish prevalence rates of irritability across the lifespan in order to empirically confirm the belief that adolescence is a time of heightened irritability. The

conflicting findings regarding relationships between age and irritability, and gender and irritability also require clarification through further research.

2.3 Irritability and psychopathology

Cross-sectional studies show irritability is associated with a wide range of psychiatric disorders including both internalising and externalising disorders. More specifically however, irritability in adolescents has been found to be predictive of suicide risk (Balazs et al., 2006; Pickles et al., 2010) and the development of internalising disorders, particularly depressive disorders and generalised anxiety disorder (Fichter et al., 2009; Leibenluft et al., 2006; Stringaris et al., 2006; Stringaris & Goodman, 2009a, 2009b).

There is evidence that the type and severity of irritability may differ between diagnostic groups but it has also been argued that as irritability is a nonspecific symptom it should not be used diagnostically, particularly in regards to bipolar disorder (Kowatch et al., 2005). However there are some studies that have found the type and severity of irritability is able to distinguish between diagnoses. Stringaris et al. (2012) found the level of reported irritability significantly differed between healthy volunteers, those diagnosed with bipolar disorder, and those diagnosed with SMD. In addition to this Mick et al. (2005) found that the severity of irritability differs between those diagnosed with attention-deficit/hyperactivity disorder (ADHD), those diagnosed with ADHD and comorbid bipolar disorder, and those diagnosed with ADHD and comorbid depression.

The remainder of section 2.3 will discuss irritability in the context of mood disorders (unipolar depression, bipolar disorder, and severe mood dysregulation), anxiety disorders, posttraumatic stress disorder, and disruptive behaviour disorders (oppositional defiant disorder, conduct disorder, and attention deficit hyperactivity disorder). Though not discussed

at length here, as these conditions are not directly relevant to the thesis, irritability is also a symptom of antisocial personality disorder, borderline personality disorder, and autism spectrum disorders (APA, 2013). Irritability is such an impairing symptom in the context of autism that the US Food and Drug Administration has approved the use of atypical antipsychotics (risperidone and aripiprazole) to treat it (discussed in detail in section 2.5.1).

2.3.1 Irritability in depressive disorders

Irritability is one of the diagnostic criteria for unipolar depressive disorders in children and adolescents in the DSM-5 (APA, 2013), but not in adults. It is the suggestion of some authors that irritability is one of a constellation of symptoms of depression in youth that is a precursor to the later development of bipolar disorder (Akiskal, 1995; Benazzi, 2004; Benazzi & Akiskal, 2005; Skjelstad, Malt, & Holte, 2010). A number of studies have found very high conversion rates (10-45%) from unipolar depression to bipolar disorder and use this as evidence to argue that irritability, among other symptoms, is an indication that the patient will go on to develop bipolar disorder (Angst, Sellaro, Stassen, & Gamma, 2005; Coryell et al., 1995; Goldberg, Harrow, & Whiteside, 2001). However, those studies that report such high levels of diagnostic conversion have samples of severely ill patients who have been hospitalised. Angst et al. (2005) discuss how it can take several years for a patient who presents with a unipolar depressive episode to have their first manic or hypomanic episode. As such, based on a review of the literature, they estimate the rate of conversion from unipolar depression to bipolar disorder as approximately 1% per year of follow up. They do not, however, speculate what the end rate of diagnostic conversion may be. There is strong evidence to suggest that irritability is a symptom of depression without necessarily leading to the development of bipolar disorder. Several studies of the symptomatology of youth depression have found over 80% of young people suffering depression or dysthymia report

irritability as a symptom (Crowe, Ward, Dunnachie, & Roberts, 2006; Masi, Favilla, Mucci, Poli, & Romano, 2001; Ryan et al., 1987; Stewart et al., 2002). Additionally those who have identified irritability as a predictor of diagnostic conversion state that it is one of a constellation of symptoms that together can be predictive of the change from unipolar depression to bipolar disorder and that no one symptom can predict the change (Benazzi, 2004; Benazzi & Akiskal, 2005). Thus while in some cases irritability in depression may be a precursor to bipolar disorder this is not always the case.

Not only is irritability a salient symptom, it is also predictive of depressive disorders. Several longitudinal studies have found that while irritability is cross-sectionally associated with a range of mental disorders, longitudinally it is predictive of only internalising disorders; in particular depressive disorders and generalised anxiety disorder (Fichter et al., 2009; Leibenluft et al., 2006; Stringaris et al., 2006; Stringaris & Goodman, 2009a, 2009b). One finding of interest is that a longitudinal study including both parent and self report measures of irritability found only parent report irritability predicted internalising disorders at the 20 year follow up (Stringaris et al., 2009a). This could be a reflection of a greater severity of irritability that manifests in a manner so that parents are aware of it. Clearly, to persist for twenty years, the long lasting effects of severe irritability during adolescence are substantial.

The symptoms of depressive disorders, including irritability, have been found to vary with age. A retrospective chart review of inpatients with depression found significant differences in the symptom frequency between children (aged 5-12 years) and adolescents (aged 13-19 years) (Borchardt & Meller, 1996). The children displayed higher levels of irritability, temper outbursts, distractibility, and physical aggression. The adolescents on the other hand experienced greater loss of appetite and energy, and had more suicide attempts. This study is limited in nature as it only assesses data in charts. It does however highlight the importance of age in the expression of symptoms. As discussed earlier (section 2.2), the

changes in hormonal levels that accompany puberty are likely to have an effect on the level of irritability an individual experiences. Thus one would expect irritability to increase during adolescence. This literature review only identified four articles that mentioned change (or lack of) in irritability in relation to age (Borchardt & Meller, 1996; Fichter et al., 2009; Leibenluft et al., 2006; Perlis et al., 2005). Two of these articles (Borchardt & Meller, 1996; Perlis et al., 2005) concerned irritability in the context of depression and indicate that irritability decreases with age, from childhood to adolescence and from young adulthood to late adulthood. However, both of these studies were cross-sectional in nature and contrast with the findings of two longitudinal studies that examine the general population (Fichter et al., 2009; Leibenluft et al., 2006) which suggest that irritability peaks during adolescence and begins to decline through adulthood. Clearly there is a need for further research to clarify the development of irritability across the lifespan and in its role in depressive disorders.

The fact that irritability is viewed as a key or defining symptom of depressive disorders in children and adolescents but not for adults does not mean that it is not a relevant and important symptom in adults as well. A large study of over 2000 adults with treatment resistant depressive disorders, the Sequenced Treatment Alternatives to Relieve Depression (STAR*D), found that 80% of adults with depression reported experiencing some irritability (Perlis et al., 2005) and 46% reported experiencing irritability at least half the time in the preceding week (Perlis et al., 2009). Such a high incidence of irritability in adults with depression suggests that perhaps irritability should be investigated as an associated feature of depressive disorders in adults. There may have been a bias in the STAR*D study as the sample was comprised of participants with treatment resistant depression therefore this finding may not generalise to all adults with depression. Another limitation to the STAR*D study was that only one item was used to assess irritability thus the reliability of the measured irritability might be low (Streiner & Norman, 2003). Additionally with only one item this

study might be only measuring one aspect of irritability. Yang et al. (2011) argue that irritability needs to be carefully assessed with a sophisticated scale as it is a multi-component psychological construct. Using the Irritability Questionnaire, a more comprehensive measure of irritability, Craig, Hietanen, Markova, and Berrios (2008) also found a strong relationship between irritability and depressive symptoms ($r = 0.62$) in adults ($N = 110$) as measured by the Hospital-Anxiety Depression Scale. Pasquini et al. (2004) examined the qualitative differences between types of depression in a sample of 222 adults with Major Depressive Disorder (MDD). They found three distinct sub-groupings of depression which they labelled; sadness/depression, anger/irritability, and anxious. There is already provision in DSM-5 for anxious depression and these authors argue for the inclusion of an angry/irritable depression. Given the evidence of a high degree of irritability in adult depressive disorders Kovess-Masfety et al. (2013) examined whether the addition of irritability as a symptom of adult depressive disorders would alter prevalence rates. This large ($N = 110,729$), multi-national study found that altering the criteria so that irritability was a core symptom that could replace sad mood, as is the case in child and adolescent depressive disorders, was not supported. They did however find that adding irritability as a symptom resulted in a proportional increase of 3.5% over baseline. While this is not a large increase the majority of participants who already met criteria for a DSM-IV depressive episode also endorsed irritability as a symptom. Thus irritability may well be a relevant symptom in adult depressive disorders and should be acknowledged as such, particularly as studies have noted irritability may not necessarily resolve under standard treatment for MDD (Tao, Emslie, Mayes, Nakonezny, & Kennard, 2010; Volonteri et al., 2010). In order to clearly understand the role irritability plays in depressive disorders and how it may change across the lifespan future research should examine the differential associations between irritability and depressive symptoms for children, adolescents, and adults.

Gender may also be an important variable in regards to irritability and depression (Crowe et al., 2006). Women have been found to experience a greater level of irritability with their depression (Perlis et al., 2005) and irritability is a symptom of postnatal depression (APA, 2013). Conversely a study examining the phenomenology of male depression in young German men (mean age 18.5 years, SD = 1.18 years) found that the best indicator of male depression was irritability (Leimkuhler, Heller, & Paulus, 2007).

Irritability in depression has been related to the severity of the depression (Crowe et al., 2006; Stewart et al., 2002). The STAR*D study found people who reported irritability were more likely to have severe depression (Perlis et al., 2005). Several studies have found irritability to be strongly associated with suicidal ideation and suicide (Conner, Meldrum, Wieczorek, Duberstein, & Welte, 2004; Lester & Lindsley, 1988; Pickles et al., 2010). Lester and Lindsley (1988) administered the Irritability, Depression, and Anxiety Scale to a group of college students (N = 242) with the aim of identifying any associations between the inward and outward irritability subscales and suicide attempts or suicidal ideation. Participants who had attempted suicide scored higher on the inwardly directed irritability subscale and obtained similar scores on the outwardly directed irritability subscale to those who had not attempted suicide. Participants who had suicidal ideation, without ever having attempted suicide, scored higher on both subscales than those without suicidal ideation. However, the results from this study regarding the inwardly directed irritability subscale should be interpreted with caution. The subscale consists of four items, two of which ask whether the respondent has ever thought about harming themselves. As such one would expect people who have had suicidal ideation or who have attempted suicide to endorse those items more frequently than those who have not. This would raise the average rate of response among this group. The positive association found by Lester and Lindsley between suicidal ideation, a marker of more severe depression, and the outwardly directed irritability subscale however,

along with the findings of others (Conner et al., 2004; Perlis et al., 2005; Pickles et al., 2010), adds strength to the argument that irritability manifests as a symptom in more severe cases of depression.

2.3.2 Irritability in bipolar disorder

Irritable mood is a core feature of mania and one of the diagnostic criteria for a diagnosis of a manic episode in both the DSM-5 (APA, 2013) and ICD-10 (WHO, 1994). There is considerable controversy about the criteria used to diagnose bipolar disorder in children and adolescents. Some authors argue that only individuals who meet the full diagnostic criteria, including duration requirements (one week for a manic episode and four days for a hypomanic episode), should be given a diagnosis of bipolar disorder (Wozniak et al., 2005). Others report that bipolar disorder often presents in children in a form that does not quite meet the criteria for adult bipolar disorder particularly in regards to the duration criteria, with children and adolescents frequently having rapid cycling (Birmaher et al., 2006; Geller et al., 2002). That is the patient has four or more episodes in the prior 12 month period that meet criteria for a manic, hypomanic, or major depressive episode (APA, 2013). The general consensus seems to be that a relaxation of the duration criteria is acceptable for diagnosis in youths as they often present with rapid cycling mood disturbance (Baroni, Lunsford, Luckenbaugh, Towbin, & Leibenluft, 2009; Danner et al., 2009). One particularly contentious issue is whether children or adolescents who present with irritable mood only, and not the elevated mood characteristic of bipolar disorder, should be given a diagnosis of bipolar disorder (Leibenluft, 2011). Taken together with emerging findings that will be fully described in the next section multiple recent studies appear to agree that those children who present with chronic irritable mood should not receive a diagnosis of bipolar disorder (Danner et al., 2009; Leibenluft, 2011; Parens & Johnston, 2010; Stringaris, 2011)

While chronic irritable mood in bipolar disorder is contentious, multiple studies support episodic irritability having high diagnostic value in bipolar disorder (Kowatch et al., 2005; Wozniak et al., 2005). A review of case files of patients with bipolar I disorder revealed 83% of children and adolescents, and 74% of adults reported irritability (Jerrell & Shugart, 2004). There was a significant difference between these percentages indicating that irritability has more valence as a symptom in youth bipolar disorder than in adult bipolar disorder. The finding of higher levels of irritability in younger patients with bipolar disorder is a consistent theme throughout the literature. Hunt et al. (2009) analysed data from youths with a diagnosis of bipolar I disorder and identified three subgroups of patients in the sample: those with irritable mood only, those with both irritable and elated mood, and those with elated mood only. It is important to note that all of these patients had episodic, rather than chronic, symptoms. The only variable that could distinguish between these subgroups was age; the irritable only subgroup was significantly younger (M = 10.5 years, SD = 2.8) than the other two groups (M = 12.7 years, SD = 3.3; M = 12.7 years, SD = 3.4). Perhaps as this subgroup ages some of them will experience mood elation.

Danner et al. (2009) reviewed the literature concerning irritability in bipolar disorder concluding that it is indeed an important symptom. The authors highlight the importance of considering whether the irritability is episodic or chronic in nature as episodic irritability is indicative of bipolar disorder while chronic irritability may not be. Mick et al. (2005) investigated the type of irritability present in three diagnostic groups of children; a group with attention deficit hyperactivity disorder (ADHD), a group with ADHD and co-morbid bipolar disorder, and a group with ADHD and co-morbid depression. All three groups indicated they experienced at least mild forms of irritability. The group with co-morbid bipolar disorder however was the only one to report a type of irritability described as more extreme and explosive in nature. Thus while some argue that irritability is a nonspecific symptom, or

marker of distress that is experienced to some degree by all who have a mental disorder (Kowatch et al., 2005), it may be that the quality and type of irritability can distinguish between psychiatric conditions.

Due to the controversy surrounding paediatric bipolar disorder Leibenluft et al. (2003) proposed four types of youth mania; the first being a narrow phenotype that conforms to the diagnostic criteria of DSM-IV-TR (APA, 2000), the second being hypomania or mania which does not fulfil the duration criteria required by DSM-IV-TR, the third being irritable mania or hypomania with clearly demarcated episodes but without elevated mood, and the fourth being chronic irritability accompanied by hyperarousal. This fourth 'broad phenotype' (p.431) bipolar disorder has been the most controversial as it lacks both the elevated mood and the episodicity that are characteristic of bipolar disorder. It is for this reason that Leibenluft et al. refer to this as severe mood dysregulation (SMD) rather than broad phenotype bipolar disorder.

2.3.3 Severe mood dysregulation (SMD)

In recent years the majority of research interest in irritability has been in the context of severe mood dysregulation. SMD differs from bipolar disorder as it does not include the symptoms of elevated mood and episodicity. Brotman et al. (2006) conducted an epidemiological study of 9-19 year olds to ascertain the prevalence and unique characteristics of SMD. The weighted lifetime prevalence of SMD was 3.3%. Longitudinally those with a diagnosis of SMD at baseline were no more likely than those without an initial diagnosis of SMD to develop an externalising disorder through the course of the study. SMD at baseline was however predictive of major depression but not bipolar disorder at the conclusion of the study. This is consistent with other research (Fichter et al., 2009; Leibenluft et al., 2006;

Stringaris & Goodman, 2009a) and supports the idea that chronic irritability is not a precursor of bipolar disorder but instead is predictive of later unipolar depressive disorders. Also consistent with other research (Dickstein et al., 2005) was the finding that there was a large degree of co-morbidity, with the highest being for externalising disorders such as ADHD, conduct disorder (CD), and oppositional defiant disorder (ODD) (Brotman et al., 2006).

There are also several other important features that distinguish between SMD and bipolar disorder. There are higher rates of familial bipolar disorder in youth with a diagnosis of narrow phenotype bipolar disorder than in those with SMD, for whom the rates of familial bipolar disorder do not significantly differ from levels found in the general population (Brotman et al., 2007). Additionally individuals with bipolar disorder have a more severe illness in terms of higher rates of psychiatric hospitalisations, more self harm, and suicide attempts (Brotman et al., 2007; Dickstein et al., 2005). However, on a measure of functioning, the children's global assessment scale (CGAS) those with SMD were found to have significantly lower scores, indicating poorer psychosocial functioning, than those with bipolar disorder (Dickstein et al., 2007).

In addition to the above there are differences in cognitive flexibility between individuals with SMD and those with bipolar disorder. Dickstein et al. (2007) found that participants with bipolar disorder performed worse than both healthy controls and participants with SMD on tasks assessing cognitive flexibility, and participants with SMD performed worse than controls. Though both of the diagnostic groups performed worse than controls they struggled on different aspects of the tasks. This is suggestive of different neurological processes underpinning the dysfunction. For example participants with bipolar disorder had deficits in both a reversal learning task and a complex reversal learning task, while participants with SMD only had deficits in the complex reversal learning task. The authors suggest the deficits seen in bipolar disorder may be due to an impaired ability to adapt to altered reward

associations. Though this research is correlational in nature and as such causality cannot be presumed. Dickstein et al. (2007) suggest the deficits displayed by those with SMD may be due to impaired selective attention processes. Rich, Schmajuk et al. (2008) measured event related potentials (ERPs) during several tasks, one of which was a frustration eliciting task. Both the bipolar and SMD groups reported experiencing greater levels of frustration than the control group. However, the ERPs revealed important psychophysiological differences between the clinical groups. The participants with bipolar disorder had reduced p3 amplitude during the frustration task which is suggestion of deficits in executive functioning. The participants with SMD, on the other hand, had normal p3 amplitude but reduced N1 amplitude on all of the tasks. This suggests problems in initial attentional processes regardless of the emotionality of the task.

Following on from this work, there is some evidence of neurological differences between bipolar disorder and SMD. A study using magnetic resonance spectroscopy (MRS) found that people with SMD have reduced level of myo-inositol, one of the functions of which is to partially regulate serotonergic systems, in the temporal lobe (Dickstein et al., 2008). Whereas another study found individuals with bipolar disorder have *increased* levels of myo-inositol (Silverstone, Mcgrath, & Kim, 2005). As discussed earlier, serotonin dysfunction has been implicated in the genesis of irritability. Given these findings perhaps under-regulation of the serotinergic systems is related to chronic irritability, while over-regulation may be related to episodic irritability. Other research has indicated that SMD and bipolar disorder may have some similar neurological deficits as these groups performed similarly to each other (Brotman, Guyer et al., 2008; Brotman, Skup et al., 2008; Rich, Grimley et al., 2008), and worse than controls and other clinical groups (ADHD, major depressive disorder, conduct disorder, anxiety) on a facial emotion recognition task (Guyer et al., 2007). Rich, Grimley et

al. (2008) discuss how these difficulties in recognising facial emotions could hamper social interactions and potentially lead to some of the temper outbursts commonly seen in SMD.

There is debate as to the nosological status of SMD. There are those who argue that it should be considered a bipolar spectrum disorder. Irritability, the core feature of SMD, is a primary symptom of bipolar disorder which is why SMD has generally been thought of as a bipolar spectrum disorder. SMD however, lacks the episodicity central to a diagnosis of bipolar disorder and, as outlined above, there is considerable evidence that suggests SMD should not be thought of as part of the bipolar disorder spectrum. Baroni et al. (2009) investigated the epidemiology of bipolar disorder not otherwise specified (BD-NOS) and identified two distinct groups; those who fit the criteria for SMD, and those whose hypomanic episodes lacked the duration required for a diagnosis of BD-II. A large number of the second group went on to develop BD-I or BD-II, while those with SMD were at risk of developing a unipolar depressive disorder not a bipolar disorder. This led the authors to suggest a separate diagnostic category for SMD rather than its current status as a bipolar spectrum disorder. Externalising disorders such as ODD also have irritability as a symptom, though it does not have as high a diagnostic value as in bipolar disorder. It has been suggested that SMD could be conceived of as a particularly severe form of ODD, accompanied by ADHD (Baroni et al., 2009). In support of this the research conducted by Rich, Schmajuk et al. (2008) measuring ERPs during psychophysiological tasks found that N1 amplitude was related to severity of ODD symptoms as well as SMD diagnosis. Other authors have suggested however, that SMD is actually better conceived of as a co-morbid diagnostic triad of ODD, ADHD, and a depressive disorder (Elia, Ambrosini, & Berrettini, 2008).

Based on the research discussed above, that has found SMD to be an important disorder in its own right, a new mood disorder similar to SMD but without the hyperarousal symptoms

has been included in the DSM-5 (APA, 2013). The criteria for disruptive mood dysregulation disorder (DMDD) can be found in Appendix A. The findings of the DSM-5 field trials regarding reliability of diagnosis were not convincing (Regier et al., 2013). The reliability of diagnosis was heavily site dependent, with one of the testing sites having acceptable inter-rater reliability and the other two sites having unacceptably low inter-rater reliability. The results of the single study that has examined the prevalence and comorbidities of DMDD call into question the decision of the DSM-5 taskforce to include DMDD as a new disorder. The decision was in part based upon the research into SMD that indicates it is distinct from bipolar disorder. However Copeland, Angold, Costello, and Egger (2013) found that DMDD and SMD had a comorbidity rate of 38.9% meaning that the majority of youths diagnosed with DMDD would not receive a diagnosis of SMD. As such the literature on SMD on which the DSM-5 taskforce based their decision may not apply to a DMDD population. Additionally there was an inordinately high rate of comorbidity with oppositional defiant disorder with odds ratios between 52.9 and 103, suggesting that DMDD may be more similar to ODD than to SMD.

2.3.4 Irritability and anxiety disorders.

In DSM-5 irritability is not restricted to only being a symptom of mood disorders. It occurs in many other areas of psychopathology and is a symptom of generalised anxiety disorder (GAD) but not of any other anxiety disorder (APA, 2013). Research to date is somewhat supportive of this. Two studies of the phenomenology of GAD in children and adolescents found that 70-81% of patients reported experiencing irritability as a symptom, with no significant differences according to age or gender (Masi et al., 2004; Masi, Mucci, Favilla, Romano, & Poli, 1999). There was a high degree of comorbidity in these samples, with 93% of participants having at least one comorbid condition. The most common of which was depression which has irritability as a symptom which would increase the chance that

irritability would be present. Irritability in adolescence is predictive of the development of GAD (Stringaris et al., 2009; Stringaris & Goodman, 2009b).

While irritability is not a symptom of other anxiety disorders according to DSM-5, research has indicated that it may be associated with panic disorder. Patients suffering from panic disorder and agoraphobia reported higher levels of irritability than controls (Fava et al., 1993).

2.3.5 Irritability and posttraumatic stress disorder

Irritability is a symptom of posttraumatic stress disorder (APA, 2013). Castillo, C'De Baca, Conforti, Qualls and Fallon (2002) used the Buss Durkhee Hostility Inventory to investigate irritability in a sample of adult males with PTSD (solely or comorbid with other conditions) and a sample of men without PTSD but with other psychiatric disorders including depression, substance abuse, adjustment disorder, anxiety disorders, and personality disorders. The men with PTSD reported higher levels of irritability than men in the other diagnosis group. Irritability is also a significant predictor of non-remission in people who suffer from PTSD after a motor vehicle accident. That is, at one year follow up those who had high scores on the irritability subscale of the Clinician Administered PTSD Scale were more likely to still be suffering PTSD than those with low scores (Blanchard et al., 1996).

2.3.6 Irritability and externalising disorders

2.3.6.1 Oppositional defiant disorder (ODD) and conduct disorder (CD)

According to DSM-5 irritability is a symptom of ODD (APA, 2013) and can be inferred as a symptom from ICD-10 criteria. In ICD-10, irritability itself is not mentioned, however, the criteria 'often loses temper' and 'is often touchy or easily annoyed by others' (WHO,

1994) appear to represent irritability. Research supports this, with a sample of youths diagnosed with either ODD or CD scoring much higher on the IDA than healthy controls (Donovan et al., 2003). Research regarding ODD alone is sparse; often samples of youths with ODD and CD are combined. Recent research however, has shown that while ODD and CD are highly co-morbid they have different longitudinal outcomes (Rowe, Costello, Angold, Copeland, & Maughan, 2010; Stringaris & Goodman, 2009a) and as such should not be studied as though they are one group. For example, ODD has been found to be predictive of overanxious disorder, major depressive disorder, and conduct disorder (Burke, Loeber, Lahey and Rathouz, 2005) whereas conduct disorder has been found to be predictive of antisocial personality disorder and substance abuse problems (Rowe et al., 2012).

ODD has a range of symptoms including both behavioural and mood symptoms and longitudinally has been found to have differing trajectories based on symptom clusters (Stringaris and Goodman, 2009a). Stringaris and Goodman (2009a) suggest that ODD can be conceived of as having three dimensions; an irritable dimension, a headstrong dimension, and a hurtful dimension. Whether an individual has more symptoms consistent with each dimension will impact upon their eventual outcomes. These authors found the irritable dimension to be associated cross-sectionally with emotional and peer problems. A longitudinal follow up of the study found that the irritable dimension was predictive of internalising disorders, specifically GAD and depressive disorders, while the headstrong dimension was predictive of ADHD, and the hurtful dimension was predictive of CD (Stringaris & Goodman, 2009a). The authors postulate that the irritable dimension of ODD captures a ‘propensity to emotional dysregulation that is shared by depressive and anxiety disorders’ (p.410).

2.3.6.2 Attention Deficit Hyperactivity Disorder

Irritability is considered an associated feature of ADHD rather than a symptom (APA, 2013). Elia et al. (2008) found 19.3% of their sample of youths with ADHD reported experiencing irritability. Individuals with combined type ADHD reported irritability more frequently than those with inattentive or hyperactive types. Unsurprisingly, given that it is an overlapping symptom, irritability was also significantly associated with the co-morbidities of affective disorders, avoidant disorder, and ODD. Irritability is a symptom of affective disorders and ODD, thus the reporting of irritability in this sample may be due to the co-morbid disorder rather than the ADHD diagnosis. Mick et al. (2005) found a much higher rate of irritability than this in their sample of youths with ADHD. Their sample included youths with ADHD, youths with ADHD and co-morbid bipolar disorder, and youths with ADHD and co-morbid depressive disorder. Much higher rates of irritability were reported in those participants with a co-morbid diagnosis; however up to 67% of those with only ADHD still reported experiencing irritability. This can partially be explained by the high rates of co-morbidity of ODD (50%) in the sample used. However, among the non-mood disordered group there was only a 36% rate of ODD co-morbidity. Irritability does occur in many individuals with ADHD but the high rates of co-morbidity in this disorder make it hard to distinguish exactly what specific role irritability plays, if any. Additionally, Leibenluft et al. (2006) found that irritability is predictive of the development of ADHD. The authors suggest that this implies ADHD involves not only dysregulated attention and activity but that there also may be some dysregulation of affect but further research is needed to clarify this. The idea that ADHD involves a dysregulation of emotions may partially explain the high co-morbidity rates between ADHD and mood disorders reported by Mick et al. (2005) and by Elia et al. (2008).

2.4 The assessment of irritability

The assessment of irritability in research contexts has used both self report and other-report via interviews and questionnaires. Some of the most commonly used methods will be discussed here, as well as a novel method and a newly developed questionnaire.

Several self report questionnaires have been used to assess irritability. Two of the older scales that have been used in several publications (e.g. Clarkin, Levy, Lenzenweger, & Kernberg, 2007; Devinsky, Ronsaville, Cox, Witt, Fedio, & Theodore, 1994; Donovan et al., 2003; Lester & Lindsley, 1988) are the Buss-Durkhee Hostility Inventory (BDHI: Buss & Durkhee, 1957) and the Irritability, Depression, Anxiety Scale (IDA: Snaith et al., 1978). Neither scale was developed for children or adolescents but some use has occurred with adolescents in the absence of youth appropriate measures. The BDHI is a 75 item self report questionnaire containing statements to which a respondent selects true or false. It contains an 11 item irritability subscale which appears to have reasonable face validity. The BDHI assesses trait hostility and trait irritability and is normed on college students which may not be a true representation of the distribution of hostility in the general population. Notably, the revised version of this scale, The Aggression Questionnaire (Buss & Perry, 1992), does not contain an irritability subscale. No explanation is given by the authors for this exclusion. In the initial selection of items for the revised scale items were selected to fit several components of aggression (e.g. physical aggression, verbal aggression, resentment) but irritability was not included as one of these components (Buss & Perry, 1992). It is likely that Buss and Perry were correct in leaving irritability out of this scale, as discussed in section 2.1, hostility, aggression and irritability are related but distinct concepts so it would be more valid to assess irritability as a separate phenomenon.

The IDA was constructed to address the need for a scale designed to measure irritability, anxiety, and depression. This was the first self report scale designed to measure irritability in

and of itself, rather than as a variable associated with hostility or aggression. This scale consists of eight items that assess state irritability, and asks respondents to indicate how they are currently feeling. The items were drawn primarily from the BDHI and divided into 'inwardly directed irritability' and 'outwardly directed irritability' subscales. The validation studies included an interviewer's estimates of irritability, which could then be directly compared to the outwardly directed irritability subscale. There was no equivalent measure with which to compare the inwardly directed subscale. It did however, correlate highly with overall psychiatric severity. Snaith and Taylor (1985) suggest this implies either that the inwardly directed irritability subscale does not measure an independent psychological concept, or that inward directed irritability is a feature of most psychiatric illnesses. Additionally when looking at the internal reliability of the internally directed irritability subscale (Snaith & Taylor, 1985) found that two of the items were not consistent with the other two and in fact appear to be measuring a self-harm construct. Thus it can be presumed that only two items are measuring irritability in a valid manner and Snaith and Taylor (1985) advise against using the inward directed irritability subscale.

Two scales, The Irritability Questionnaire (Craig et al., 2008) and the Born-Steiner Irritability Scale (Born, Koren, Lin, & Steiner, 2008), do not appear to have been used by any researchers other than the authors. The Irritability Questionnaire has a 21 item self report format and a 10 item carer report format. It was designed to measure irritable mood and any subcomponents of irritability. The scale appears to have good reliability and validity (Craig et al., 2008) yet there are no other published papers using the scale and the original paper has only been cited a few times in the literature. Perhaps the reason why this scale hasn't been adopted for use is that the original validation study included a group of people with Alzheimer's disease and a group of people with Huntington's disease. The majority of papers that cite this work are papers about neurological problems such as traumatic brain injury

(Yang et al., 2011), Huntington's disease (Nimmagadda, Agrawal, Worrall-Davies, Markova, & Rickards, 2011), and dementia (Shub et al., 2011). The psychometric properties of the measure with samples with mental illness are unclear.

The Born-Steiner Irritability Scale was designed for use specifically with women particularly in the context of female-specific mood disorders such as premenstrual dysphoric disorder and postnatal depression. This may explain why it has not been widely adopted for use as many studies wish to investigate irritability in both males and females. It is a 14 item self report scale that asks respondents to indicate on a four point Likert scale how they have felt in the past week. The self report version also includes seven visual analogue items asking participants to rate how irritable they are now and how irritable they usually are, as well as how irritability has affected several areas of functioning in the past week. It also has a five item observer rating scale with three items scored on a four point Likert scale as well as two visual analogue scale in which the observer rates the individual's level of irritability and the degree to which that irritability impact on the individual's life. The measure appears to have good reliability however the only validity test used for this measure was a comparison of self report ratings and the observer report ratings of irritability. It was not tested against any alternative irritability measures. Thus it is not known whether this measure is a valid assessment of irritability.

The Aberrant Behavior Checklist (Aman, Singh, Stewart, & Field, 1985) is a scale that was developed to measure behaviour problems in intellectually disabled children. An observer is asked to rate the child's behaviour over the last four weeks. There are 58 items scored on a Likert type scale (0 = not at all a problem, 1 = the behaviour is a problem but slight in degree, 2 = the problem is moderately serious, 4 = the problem is severe in degree). The items sum to form five subscales; irritability, lethargy, stereotypy, hyperactivity, and inappropriate speech. The irritability subscale consists of 15 items including items about

temper tantrums. However, the subscale also contains three items enquiring about self harm, one item about depressed mood, and one item about violence toward others. While Aman et al. (1985) found these items to all load onto one factor, conceptually they are measuring different constructs.

Recent investigations have used information from structured diagnostic interviews to ascertain irritability. These interviews have been used for both parent and self report (Leibenluft et al., 2006; Mick et al, 2005; Stringaris et al., 2009). Using these methods allows for the identification of the frequency and also the severity of irritability experienced. It also grants investigators the ability to determine whether the irritability reported is a substantial departure from an individual's typical mood. Table 1 displays some examples of irritability questions contained within commonly used diagnostic interviews. The main issues with using interviews to assess irritability are that it is a costly and time consuming method and that there are only a few items measuring irritability. The fewer items assessing a construct the less reliable that rating is (Streiner & Norman, 2003).

An important part of youth mental health assessment is obtaining parent report data (Achenbach et al., 2008). Stringaris et al. (2009) found at a twenty year follow up that parent report, but not self report, irritability was predictive of internalising disorders. This could be a reflection of a greater severity of irritability that manifests in a manner so that parents are aware of it. Another explanation is that individuals are reluctant to report behaviours or feelings, such as irritability, that are not socially desirable. Whatever the cause of the differing predictive power of parent versus self report irritability this study highlights the need to obtain information from a variety of sources, as is standard in child and adolescent assessment (Breuk, Clauser, Stams, Slot, & Doreleijers, 2007). While interview methods may allow the clinician to gain more detailed information about a person's irritability compared to current questionnaires they are a time consuming and costly alternative.

Table 1

Selection of Example Questions on Irritability from Three Commonly Used Diagnostic Interviews

Interview	Section	Questions
K-SADS (self report)	Depressed mood	Do you get annoyed & irritated, or cranky at little things? What kind of things?
	ODD	Are there times when you become so angry that you stomp and yell? Have a temper tantrum? How frequently does this occur?
DAWBA (parent report)	GAD	Does worrying lead to irritability? In general? More days than not in the last 6 months?
	Depression	In the last 4 weeks have there been times when ... has been grumpy or irritable in a way that has been out of character for him/her?
DISC (self report)	Depression	In the last year was there a time when you often felt grouchy or irritable and often in a bad mood, when even little things would make you mad?
	GAD	In the last year, when you were worried, were you grouchy or irritable … bothered even by little things?

K-SADS: Kiddie Schedule for Affective Disorders & Schizophrenia for School Age Children, DAWBA: The Development and Well-Being Assessment, DISC: The Diagnostic Interview Schedule for Children.

A novel method of assessing irritability was devised by Acri and Grunberg (1992). These authors argued that when one is not currently being presented with an irritating stimulus it can be difficult to objectively gauge how irritable one actually is. They developed the Reactive Irritability Scale (RIS), which involves participants listening to a series of noises and rating how annoying they are compared to a reference noise. The authors theorised this would be a more accurate way to measure irritability than self report measures as it presents the participants with a stimulus, and it removes the bias of a socially desirable response. The measure was found to accurately differentiate smokers who had ceased smoking (and thus may be quite irritable as they were suffering nicotine withdrawal) from smokers who were continuing to smoke, and non-smokers. The original scale was quite lengthy as it contained two practice items and 11 target sounds. Each time a target sound was presented the reference sound was also presented this resulted in the measure taking approximately 30 minutes to complete (Faraday, Scheufele, Vander Ley, & Grunberg, 2005). Therefore a shortened version was created, the RIS-II (Faraday et al., 2005). The RIS-II only has seven target sounds and takes approximately 13 minutes to complete. The validation studies for the RIS-II found it can accurately distinguish between different groups based on how irritable those groups were hypothesised to be. For example, a stressed group who were asked to practice progressive muscle relaxation reported the sounds to be less irritating than a stressed group who were exposed to silence before completing the RIS-II. However, one of the validation studies involved a group of chronic pain patients. Within this group the level of irritation for the noises was dependent upon the presentation order. For example, when the reference noise was rated in position eight it was given a higher rating than if it was presented in position two. This calls into question the reliability of the measure as the reference noise, which should be static, changed in its rating dependent upon the presentation position. A limitation

of this measure is that it can only assess current irritability and as such it may be of limited use in clinical settings.

The vast majority of self report paper and pencil questionnaires have been designed and validated for use with adults. Thus while some measures have been adapted for use with children and adolescents it is not known whether they are valid for use with these age groups and this could hinder the understanding of the developmental nature of irritability. Additionally the majority are self report only and as already discussed it is important to obtain information from multiple reporting sources when assessing children and adolescents. Stringaris et al. (2012) developed a concise scale to measure irritability in children and adolescents, the Affective Reactivity Index (ARI). The ARI is a brief, paper-and-pencil scale that has both parent report and child report versions. The scale consists of six items that make statements about the frequency, duration, and threshold of anger and irritability. There is also a seventh item which aims to assess impairment due to irritability. Each item requires respondents to indicate on a three point Likert scale (ranging from 0 = not true to 2 = certainly true) how true each statement is of them (or of their child). Though the scale is new it has promising initial data regarding psychometric properties, with one paper published on the psychometrics (Stringaris et al., 2012). The ARI has a high level of internal consistency with Cronbach alphas of 0.92 and 0.89 for the parent report version and 0.88 and 0.90 for the self report version of the scale. There is also a good level of agreement between parent and self reported irritability on the ARI (r = 0.58 and r = 0.73). In terms of validity the ratings increased, as expected, across diagnostic groups so that healthy volunteers had the lowest ratings, followed by those diagnosed with bipolar disorder, with those diagnosed with SMD having the highest ARI scores (Stringaris et al., 2012). Recently the ARI was used in the DSM-5 field trials to assess the cross-cutting symptom of irritability (Narrow et al., 2013). The inclusion of irritability as a cross-cutting symptom in DSM-5 and the use of the ARI to

assess irritability will attempt to resolve a number of the issues discussed in this section and in section 2.1. The use of the ARI in the DSM-5 field trials suggests that it might emerge as a gold standard for the measurement of irritability. Additionally if this tool is the way in which irritability is measured, it can be presumed that the DSM-5 cross-cutting symptom of irritability is defined as 'easy annoyance and touchiness, [that] is characterised by the emotion of anger, and temper outbursts can be its behavioural manifestation' (Stringaris, 2011, p. 61).

The assessment of irritability has progressed from its inclusion as a subscale of hostility in the BDHI to a phenomenon measured in its own right. Several methods of assessing irritability have been devised. The RIS-II is a novel method that may be useful for measuring current irritability in research contexts, though its reliability and clinical utility is questionable. Interviews have provided a good source of information for research and are clinically useful however they are time consuming and costly as they must be administered one on one. Questionnaires are the quickest and easiest way to assess irritability however of those that specifically measure irritability only one, the ARI, has both parent and self report formats making it appropriate for use with children and adolescents. The ARI is the most promising irritability scale published to date but further studies of its psychometric properties are needed to determine if it is suitable for use with adults and if it is sensitive to change which would make it highly useful in a clinical setting. When clinicians routinely begin measuring cross-cutting symptoms during assessment of a patient there will be a rich source of new information about irritability. This may lead to new conceptualisations of psychiatric disorders (Narrow et al., 2013).

2.5 Treatment of irritability

As discussed above, irritability is a symptom of a range of psychiatric disorders. Thus if there were effective treatment strategies to reduce irritability it could be relevant to many conditions. It is important to treat irritability as it can be a highly debilitating symptom (Yang et al., 2011). Additionally irritability during adolescence is an independent predictor of suicide (Pickles et al., 2010) and internalising disorders (Brotman et al., 2006; Leibenluft et al., 2006; Stringaris et al., 2009; Stringaris & Goodman, 2009a). In order to prevent these negative sequelae irritability should be treated during adolescence. The US Food and Drug Administration (FDA) has acknowledged the impact that irritability can have and has approved two drugs, risperidone and aripiprazole, for the treatment of irritability in people with autism given evidence of efficacy from randomised controlled trials (FDA, 2006, 2009). However, irritability in the research investigating autism has a different definition to the way it has been defined in other research. The clinical trials that will be discussed below use the Aberrant Behavior Checklist (ABC) irritability subscale as the outcome measure. As discussed in the assessment section this subscale includes items that assess self harm and depression in addition to irritability. Thus it is not clear whether the same results would be achieved if a more focused assessment of irritability was used as the outcome measure. Aside from in the context of autism, little research has been conducted that specifically focuses on treating the symptom of irritability. Thus when discussing treatment of irritability one must refer to research into treatments of disorders that specifically mention whether the treatment regimen impacted upon reported levels of irritability.

2.5.1 Pharmacological treatment

Perhaps the most thoroughly researched pharmacological treatments for irritability are the atypical antipsychotics. The FDA has approved the atypical antipsychotics risperidone and aripiprazole for treatment of irritability in autism. There have been a number of randomised control trials (RCTs) that have found risperidone to be an efficacious treatment of irritability (as measured by the ABC) and superior to placebo in people with autism (Arnold et al., 2010; McCracken et al., 2002; Pandina, Bossie, Youssef, Zhu, & Dunbad, 2007). Similar results have been found in an RCT using aripiprazole (Curran, 2011) and an open label trial has demonstrated the utility and tolerability of aripiprazole for the treatment of irritability in children with autism (Marcus et al., 2011). There have been a few trials assessing the efficacy and tolerability of these atypical antipsychotics at reducing irritability in other populations. Krieger et al. (2011) found risperidone significantly decreased ABC-irritability and increased global functioning in an open label trial with patients with SMD. Risperidone is also effective in reducing irritability (as measured by the Neuropsychiatric Inventory) in patients with dementia, however there are issues with tolerability; a number of patients developed extra-pyramidal symptoms and others showed dose-dependent worsening of pre-existing extra-pyramidal symptoms (Onor, Saina, Trevisiol, Cristante, & Aguglia, 2007). While Mankoski, Zhao, Carson, Matthew, and Forbes (2011) demonstrated that aripiprazole improved all symptoms, including irritability, measured by the Young Mania Rating Scale in a sample of youths with paediatric bipolar disorder, the largest effect size was for irritability.

Another pharmacological treatment that has reasonable evidence as to its effects on irritability is the selective serotonin reuptake inhibitors (SSRIs). It is important to note that these studies were not specifically designed to treat irritability. In a review of the literature Halbreich et al. (2006) reported that SSRIs have been found to be an efficacious treatment of

premenstrual stress (PMS) and premenstrual dysphoric disorder (PMDD) where other types of antidepressants have not. Halbreich et al. discuss how SSRIs are particularly effective on mood symptoms, especially irritability and that despite the delay in SSRIs reducing symptoms of depression, when they are prescribed for women with PMDD they are able to control symptoms, including irritability, by taking the drugs on an intermittent schedule. In fact SSRIs were found to reduce irritability and anger significantly more than placebo within fourteen hours of taking the tablets. Symptoms were measured using simple visual analogue scales whereby higher ratings indicated a higher level of the symptom (Landen, Erlandsson, Bengtsson, Andersch, & Eriksson, 2009). Tao et al. (2010) studied a sample of children and adolescents with major depressive disorder (N = 168) being treated with fluoxetine. At baseline 97% of the participants reported irritability (as measured by the Children's Depression Rating Scale-Revised) and after 12 weeks of treatment 40% of all participants were still experiencing irritability, and of those participants who had remitted 10.5% were experiencing irritability as a residual symptom. The authors make the argument that these results indicate irritability may be one of the more difficult symptoms to treat and that patients who experience irritability with their depression may need concurrent psychotherapy to fully recover.

There have been a few studies that report on the efficacy of drugs that do not fall into the atypical antipsychotic or SSRI category in reducing irritability. Connor, Glatt, Lopez, Jackson, and Melloni (2002) conducted a meta-analysis to examine the use of stimulants in the treatment of overt and covert aggression in people with ADHD. They found that methylphenidate, dextroamphetamine, and pemoline all reduce aggression in the context of ADHD though the effect sizes were larger for methylphenidate and dextroamphetamine. Caution must be taken when relating this study to irritability however, given the differences between aggression and irritability (see Section 2.1). A few studies have examined the effects

of mood stabilisers in reducing irritability. A RCT of lithium on children with SMD (N = 25) found it to be no better than placebo at improving symptoms (Dickstein et al., 2009). In a double-blind randomised trial of divalproex versus risperidone in the treatment of paediatric bipolar disorder not only was risperidone a more efficacious treatment for irritability as measured by the Overt Aggression Scale, but the divalproex group had a 48% drop out rate with increased irritability cited as the most common reason for drop out (Pavuluri et al., 2010).

Some medications may, as a side effect, actually increase the level of irritability experienced by patients. Volonteri et al. (2010) gave adults with major depressive disorder duloxetine, a serotonin-norepinephrine reuptake inhibitor, in an open label study. They discovered one of the most commonly reported side effects of the medication was irritability, however they also found that irritability was related to high plasma duloxetine levels. Additionally the effectiveness of the drug was on an inverse curve so that low plasma levels of duloxetine had little effect, medium levels had good effect on depressive symptoms, and increased levels had little effect. Thus duloxetine may be effective in reducing depression but higher dosages were associated with increased irritability. Torres et al. (2011) administered atomoxetine, a selective norepinephrine reuptake inhibitor, to youths with epilepsy and ADHD (N = 27). There was a high rate of discontinuation of medication with 26% of those who discontinued citing increased irritability as the reason.

Thus there is some evidence to support the use of atypical antipsychotics and SSRIs in the treatment of irritability in the context of a mental illness. The evidence for other medications is however limited and from the studies reviewed above, the diagnosis in which the irritability occurs may be an important variable in whether the medication will effectively reduce irritability. For example, SSRIs are very effective in reducing irritability in the context of PMDD but perhaps less so in the context of MDD.

2.5.2 Psychotherapeutic treatment

There are empirically validated treatments for disorders that feature irritability as a symptom (e.g. cognitive behaviour therapy for the treatment of major depressive disorder (Rohde, Seeley, Kaufman, Clarke, & Stice, 2006; van Hees, Rotter, Ellerman, & Evers, 2013) and GAD (Covin, Ouimet, Seeds, & Dozois, 2008)). However, there are few treatment studies using psychotherapy that specifically mention whether irritability improves over the course of treatment. Psychotherapy may be of use in the treatment of irritability as it teaches patients important skills, such as emotion regulation skills (Hinton, Pich, Hofmann, & Otto, 2013), which may also be of use in managing irritability. Leigh, Smith, Milavic, and Stringaris (2012) describe the principles behind why cognitive behavioural therapy (CBT) should improve irritability. CBT is a therapy that is based on the idea that cognitive processes, behaviours and emotions are all inter-related and impact upon one another. If a person can modify their thoughts about a particular situation this should also change their behaviours and emotions (Hofmann & Reinecke, 2010). Leigh et al. (2012) argue that repetitive thinking exacerbates irritability and that mindfulness based CBT teaches people how to reduce repetitive thinking and as such should reduce irritability although no clinical trials to test this have been conducted as yet. Alderman (2003) describes a case study of a patient with traumatic brain injury. In this patient the frequency of irritability increased from six to twelve months post-injury, while other symptoms had either stabilised or decreased. CBT was successful with this patient reporting decreased levels of irritability and aggression. CBT in children with obsessive compulsive disorder has been found to significantly reduce ‘temper outbursts’ (Krebs et al., 2012, p. 7). Mindfulness-meditation was found to reduce irritability, measured by the Symptoms of Stress Inventory, in adult cancer patients compared to a waitlist control group (Speca et al., 2000).

Maternal emotion coaching, 'a socialization process wherein parents provide guidance in understanding and coping with emotion' (p.800), predicts anger regulation amongst adolescents (Shortt, Stoolmiller, Smith-Shine, Eddy, & Sheeber, 2010). Increased levels of maternal emotion coaching result in improved anger regulation. In this study anger regulation was composed of two indicators; anger difficulty and irritability, measured by the Early Adolescent Temperament Questionnaire irritability scale. Thus one can extrapolate that maternal emotion coaching reduces irritability indicating that emotion regulation skills, particularly in regards to anger, might be an important target in the reduction of irritability. Shortt et al.'s (2010) findings highlight the role that parents may play in the development of irritability in children and adolescents. It is possible that parenting interventions may prove a successful method for the treatment and/or prevention of irritability in young people. For example, the Triple P program of parenting intervention has proved successful at both treatment and prevention of disruptive behaviour disorders such as ADHD, ODD, and CD (de Graaf, Speetjens, Smit, de Wolff, & Tavecchio, 2008). As discussed in section 2.3.5 irritability is common in young people with externalising disorders. Thus it is possible that the Triple P program, or similar interventions, would reduce irritability in young people, however specific evidence is not currently available.

Irritability is a prominent symptom of borderline personality disorder. Dialectical behavioural therapy (DBT) is a commonly used therapy for the treatment of borderline personality disorder (BPD). In a randomised trial (N = 60) DBT was found to be superior to standard group therapy for patients with BPD (Soler et al., 2009). While both conditions reduced irritability (measured by the BDHI) the reduction was greater in the DBT group. Clarkin, Levy, Lenzenweger, and Kernberg (2007) compared three therapies for BPD (DBT, transference-focused therapy, and supportive treatment). All therapies resulted in overall

improvement, though transference-focused therapy was the only one that specifically improved irritability as measured by the Anger, Irritability, and Assault Questionnaire[1].

2.5.3 Combined treatment

While there is some evidence supporting the use of medications in the reduction of irritability, particularly atypical antipsychotics in people with autism, these will not be effective for all patients. Even if they are effective there are potential side effects to the medications that need to be taken into consideration. Frazier (2012) discusses the need to take the context of the individual patient into consideration when deciding upon an appropriate course of treatment. In referring to irritability in the context of autism, Frazier argues that for some medication is the best treatment, while others may fare better with the application of behavioural therapy. While for others a combination of medication and behaviour therapy may be the most efficacious treatment option. While Frazier's editorial discusses irritability in autism, he raises the point that medication or therapy alone may not be the best treatment for any given patient. Rather a combination of the two may produce the best results, with the addition of therapy potentially allowing for lower doses of medications and thus fewer side effects, though this needs to be tested empirically.

There have been only two published studies that report on the response of irritability to a combined medication and psychotherapy treatment regimen. Linehan, McDavid, Brown, Sayrs, and Gallop (2009) trialled olanzapine and DBT in a group of patients with borderline personality disorder (N = 24). They found that DBT alone and combined therapy were both effective at reducing irritability and were not significantly different from each other. The combined therapy however reduced irritability much more quickly than DBT alone. This study did not include a medication only group. Waxmonsky et al. (2008) discuss a trial of

[1] Note that the original article citing the Anger, Irritability, and Assault Questionnaire has been removed from the journal's website and an attempt to contact the primary author of the paper was unsuccessful. Thus it is not clear whether this measure was actually assessing irritability as it is defined in this thesis.

methylphenidate and behaviour modification therapy on a group of children with comorbid ADHD and SMD, and a group of children with ADHD only. The combination therapy was effective in reducing mood symptoms in the SMD group, with it being most efficacious on the irritability/aggression mood symptoms with these symptoms improving by 45%. The degree of improvement in this sample was similar to that reported in a trial of olanzapine (43% improvement for irritability and aggression symptoms) in patients with paediatric bipolar disorder (Tohen et al., 2007). Waxmonsky et al. (2008) argue that this means the mood symptoms of SMD can be improved through the use of therapy and stimulants without resorting to treatments using antipsychotics or mood-stabilisers which have potentially worse side effects than stimulants. While this treatment schedule was effective in reducing symptoms in children with SMD, a large number of participants remained quite impaired at the end of the nine week treatment regimen suggesting that while it did provide help it was not enough. A randomised control trial of 127 adolescents with depressive disorders found that irritability improved equally across three treatment conditions; sertraline only, CBT only, and combined sertraline and CBT (Melvin, Tonge, Mulraney, Gordon, & Taffe, in preparation). This indicates that for some patients combined treatment may have no advantage over psychotherapy or psychopharmacological treatment.

Atypical antipsychotics have the greatest amount of empirical support for the treatment of irritability, at least for people with autism. However, there can be quite severe side effects and as such these are not ideal for all patients and likely are not a first line treatment. There is clearly a need for further research into treatment of irritability particularly as it can be one of the most devastating psychiatric symptoms experienced (Yang et al., 2011) and some medications, such as duloxetine and divalproex, may actually worsen irritability (Pavuluri et al., 2010; Volonteri et al., 2010). Leigh et al. (2012) discuss the potential benefits of CBT in the treatment of irritability and there is some evidence to support the use of behavioural

therapy and DBT. The work of Waxmonsky et al. (2008) however demonstrates that in complicated cases of extreme irritability it is likely that psychological therapy alone would not be sufficient to treat irritability. Thus there is a need for trials of the combination of therapy with atypical antipsychotics or SSRIs as this may well prove to be the most effective way to treat extreme irritability.

2.6 Conclusions

Irritability is clearly a robust and important psychological symptom in youths and adults. Despite the limitations of past research, consistent findings mean that some solid conclusions can be drawn. Irritability is a phenomenon that occurs in both normal and psychiatric populations. It is a widely held belief that irritability is at a peak during adolescence, though more research is clearly needed to support this assertion. Such research should establish what a typical level of irritability is in adolescents and whether this differs between healthy adolescents and those with a mental health problem. It is important to also ascertain what other factors influence the level and type of irritability an adolescent may experience. The relationship between irritability and age appears to be complicated. Future research should examine irritability across the lifespan.

The inclusion of irritability as a symptom of child and adolescent depressive disorder, but not adult depressive disorders, has been a point of contention for some authors. Some argue that it is a precursor for to the development of bipolar disorder (Akiskal, 1995; Benazzi, 2004; Benazzi & Akiskal, 2005; Skjelstad et al., 2010) though research to date does not provide strong support for this stance. Irritability is an important symptom of depressive disorders in children and adolescents in its own right. It has also been argued that irritability is not unique to child and adolescent depressive disorders, but is also a relevant and important symptom in adults depressive disorders (Perlis et al., 2005). Future research should

investigate the differential associations between irritability and depressive symptoms across the lifespan from early childhood to late adulthood.

In terms of bipolar disorder, research has shown irritability to be a valid and important symptom. However, if an individual does not have clearly demarcated episodes or elated mood bipolar disorder is not likely to be the correct diagnosis (Leibenluft et al., 2006). Though irritability is a symptom of many disorders research has found that there are discernible differences in the intensity of the irritability experienced (Mick et al., 2005). So while irritability itself is a non-specific psychological symptom the experience of irritability particularly intensity, frequency, and duration may be specific to certain disorders. Further research is required to determine the predictive relationship between irritability and psychopathology, its psychopathological phenomenology and its developmental and life course.

Irritability in adolescence is associated with a range of adverse outcomes including increased risk for suicide (Pickles et al., 2010) and the development of internalising disorders (Fichter et al., 2009; Leibenluft et al., 2006; Stringaris et al., 2009; Stringaris & Goodman, 2009a, 2009b). Thus it is vital that a method of identifying these high risk youths is developed alongside methods of treatment and prevention. Research into the treatment of irritability has been very limited though given the negative sequelae and the inclusion of an irritable disorder (DMDD) in DSM-5 there is a clear need for research into effective treatments for irritability. From the research conducted to date atypical antipsychotics have the most empirical support but more research needs to be conducted into combined pharmaceutical and psychological treatments.

2.7 Aims and Hypotheses

The thesis will begin to address some of the gaps in the research that have been identified in this literature review. Specifically the major aims and hypotheses for this thesis are:

1. To report the psychometric properties of the ARI on a sample of Australian adolescents and also to present the first psychometric data for its use with adults. There are several hypotheses associated with this aim in regards to the validity of the measure:
    a) It was hypothesised that there would be a single factor structure to the ARI for both parent and adolescent self report versions as found by Stringaris et al. (2012) and that there would also be a single factor structure for the adult self report ARI.
    b) It was hypothesised that there would be a positive correlation between the ARI and the irritability item on the Reynolds Adolescent Depression Scale-2 for adolescents and a positive correlation between ARI score and the irritability items on the Generalised Anxiety Disorder Screen, and Centre for Epidemiologic Studies Depression Scale for adults.
    c) For adolescents it was hypothesised that convergent validity would be demonstrated through positive associations between irritability (ARI score) and the emotional problems, conduct problems, and hyperactivity/inattention subscales of the Strengths and Difficulties Questionnaire and a positive correlation between ARI score and the Reynolds Adolescent Depression Scale-2.
    d) For adults it was hypothesised there would be a positive correlation between irritability (ARI score), a measure of depressive symptoms, and a measure of generalised anxiety symptoms (of which irritability is a symptom) but not social anxiety symptoms (of which irritability is not a symptom) thus demonstrating both convergent and discriminant validity.

2. To directly compare the level of irritability and the level of impairment of functioning associated with irritability between adults and adolescents.
    a) It is hypothesised that adolescents will report both a higher level of irritability and a higher degree of impairment of functioning due to irritability than adults.
3. To compare the associations irritability (and impairing irritability) has with psychopathology between adults and adolescents.
    a) It is hypothesised that there will be a relationship between irritability and depressive symptoms in adults but that the relationship between irritability and depressive symptoms will be stronger in adolescents.
4. To determine if the level of irritability and level of impairment associated with irritability is different between normal and clinical samples.
    a) There will be a positive relationship between irritability and psychopathology in a normal sample.
    b) The level of irritability and impairment associated with irritability will be higher in a clinical sample than in a normal sample.
5. To investigate if irritability is a discriminating symptom between internalising and externalising disorders.
    a) There will be a stronger relationship between irritability and internalising symptoms than between irritability and externalising symptoms.

Chapter 3

Methodology

The main aim of this chapter was to provide a detailed description of the methodology employed in this research. This is a thesis by publication and only limited information is provided in journal articles about the participants, procedures, and measures used. As such this chapter discusses in depth the psychometric properties of each measure and why they were selected for this study. It also provides in depth details about the procedure and the recruitment and composition of each sample.

Methodology

Before beginning the research ethical approval was sought and obtained from all relevant institutions. These included Monash University, Southern Health, The Victorian Department of Education and Early Childhood Development, and the Australian Catholic Education Office. Approval letters and participant information and consent forms are attached in Appendix D.

Participants

Three data collection strategies were used in this thesis, employing different assessment measures and techniques across the four samples of participants. One of the adolescent school samples had self report data only and participants did not complete the Strengths and Difficulties Questionnaire (SDQ). The other school sample and the adolescent clinical sample both had parent report data collected and completed the SDQ. The adult sample completed questionnaires online, while all three adolescent samples completed hard copy questionnaires. All three data collection strategies employed the same measure of irritability, the ARI. As such the data from the different samples was amalgamated in various ways in the papers in order to address the aims in the best way possible.

School samples

Inclusion criteria were any adolescents attending the participating schools aged between 11 and 19 years of age. Exclusion criteria were any adolescents for whom their and/or their parent's English was not fluent, and adolescents who had intellectual disability such that they were not able to comprehend the questionnaires.

Participants from the first school sample were 164 adolescents recruited from six Australian secondary schools that included private and public schools, in metropolitan Melbourne and regional Victoria and Tasmania. Of students invited to participate the

response rate was 15.4%. Twenty parents were uncontactable or declined to answer the parent report questionnaires resulting in complete data for 144 parent-child dyads. The mean age of participants was 15.77 (SD = 2.00) and 105 (64%) were female. Of the parents 124 (84.9%) were mothers, 20 (13.7%) were fathers and 2 (1.4%) were other (1 grandmother, 1 stepfather). Parental level of education was used as a proxy for socioeconomic status; 21.3% of mothers and fathers had completed a postgraduate qualification, 25.6% of mothers and 23.8% of fathers had completed a bachelor degree, 22% of mothers and 20.7% of fathers had completed a trade or certificate, 11% of mothers and fathers had completed high school, and 9.1% of mothers and 7.3% of fathers did not complete high school.

Participants from the second school sample were 232 adolescents (M = 15.26 years, SD = 1.80 years), 129 (56%) of which were female. These participants had self report data only. Participants attended one of five independent co-educational schools. Using socio-economic status rankings from the Australian Bureau of Statistics Census (ABS, 2006), two of these schools were located in upper middle class suburban areas (41%), two in lower middle class suburban areas (35%), and one in a lower middle class rural area (24%). Socio-economic classes were determined by average household income values and housing costs for each school suburb.

Adolescent Clinical sample

Inclusion criteria were any patients receiving treatment for mental health problems aged between 11 and 19 years of age. Exclusion criteria were any children for whom they and/or their parents were not fluent in English, and any children who are too mentally unwell to complete the questionnaires (i.e. if the patient has an intellectual disability or acutely

psychotic or violent). Patients were assigned diagnoses by a multidisciplinary team including a consultant psychiatrist according to DSM-IV criteria.

Participants were 31 patients recruited from an adolescent inpatient unit (n = 25), an outpatient unit (n = 3), and a private practice (n = 3). Parents of 10 participants chose not to complete the parent report measures resulting in 21 complete dyads. Of those who completed parent report measures 17 (80.95%) were mothers, 3 (14.29%) were fathers, and 1 (4.76%) was a grandfather. The mean age of participants was 15.29 (SD = 1.32) and 22 (70%) were female. Parental level of education was used as a proxy for socioeconomic status; 5.3% of mothers and 15% of fathers had completed a postgraduate qualification, 36.8% of mothers and 15% of fathers had completed a bachelor degree, 26.3% of mothers and 30% of fathers had completed a trade or certificate, 5.3% of mothers and 20% of fathers had completed high school, and 26.3% of mothers and 20% of fathers did not complete high school. The majority of patients (n = 20) had a primary diagnosis of major depressive disorder while the other 11 had a variety of diagnoses; oppositional defiant disorder (n = 2), Asperger's disorder (n = 2), borderline personality disorder (n = 2), bipolar disorder (n = 1), schizophrenia (n = 1), conduct disorder (n = 1), adjustment disorder (n = 1). Five participants had one comorbid diagnosis and 12 participants had two comorbid diagnoses. Comorbid diagnoses included borderline personality disorder (n = 2), schizotypal personality disorder (n = 1), anorexia nervosa (n = 1), dysthymia (n = 3), social anxiety disorder (n = 1), generalised anxiety disorder (n = 1), and attention deficit hyperactivity disorder (n = 2).

Adult sample

Inclusion criteria were any adults aged between 20 and 65 years of age. Exclusion criteria for the adult sample were; anyone whom was not fluent in English, and anyone whose reading level was not sufficient for them to comprehend the questionnaires.

Participants were 270 adults recruited through the use of posters and online advertising (copies of the advertising material can be found in Appendix C). Forty nine participants did not complete the questionnaire leaving a total of 221 adult participants. The mean age of participants was 27.22 (SD = 8.86) and 162 (74%) were female. The education level of adult participants was as follows: 31.2% had completed high school, 11.8% had completed a trade or certificate, 41.2% had completed a bachelor degree, and 15.8% had completed a postgraduate qualification.

Materials

Adolescent Demographic Questionnaire

The demographic questionnaire asked for basic information about the participant. The parents of adolescent participants were asked the child's sex and date of birth, as well as the relationship between the respondent and the child (i.e. mother, father, other). Finally the questionnaire enquired about the highest level of education achieved by the child's parents (primary school, some high school, completed high school, trade/certificate, bachelor degree, postgraduate degree). This was used as a proxy to estimate socioeconomic status (SES). The most effective way to determine SES is by enquiring about a range of factors including education level, income, and occupation. However, when only using one factor to estimate the SES of a child the APA taskforce on SES (2007) argue that parental education level is the most appropriate proxy.

Adult Demographic Questionnaire

The demographic questionnaire asked the adult sample for the participant's sex and age in years. It also asked for highest level of education completed by the respondent, however as some of the adults would not yet have completed their education respondents

were also asked their postcode as a way to approximate SES. Given that the composition of the final sample consisted primarily of young adults, postcode was chosen as the proxy for SES.

Irritability Questionnaires

Affective Reactivity Index (ARI: Stringaris et al., 2012)

The ARI was developed to assess irritability in children and adolescents and includes both parent and self report formats. The scale consists of six items that make a statement about the frequency, duration, and threshold of anger and irritability. There is also a seventh item which assesses impairment due to irritability. Each item requires respondents to indicate on a three point Likert scale (ranging from 0=not true to 2=certainly true) how true each statement is of them (or of their child).

The scale has been found to be internally consistent with alphas ranging from .88 to .92 and the authors found the longitudinal stability after one year for parent report was very high ($r = .88$, $p < .001$) though much lower for self report ($r = 29$, $p < .28$) (Stringaris et al., 2012). Validity studies have found that scores on the scale discriminate between healthy volunteers, children with bipolar disorder, and children with severe mood dysregulation (Stringaris et al., 2012).

Although this scale was designed for use in children and adolescents none of the items are worded in a way that would preclude the use of the scale with an adult population. As such, after consultation with the test's author, it was deemed appropriate to retain the ARI to assess irritability in the adult population. Copies of the parent report and self report ARI (along with all other measures used) can be found in Appendix B.

The Cranky Thermometer (Melvin, Tonge, Mulraney, Gordon & Taffe, in preparation)

This measure is a visual analogue scale that asks respondents to rate their peak irritability on a scale of zero to one hundred, with zero being not at all irritable and one hundred being very, very irritable. There are three Cranky Thermometers; one that asks about current irritability, one that enquires about peak irritability ever, and one that asks about peak irritability over the past two weeks.

In this thesis only the Thermometer assessing peak irritability over the past two weeks was used as it has the most robust psychometric properties (Melvin et al., in preparation). The Cranky Thermometer has acceptable test-retest reliability with an intraclass correlation of 0.64. It has also been found to be a valid measure of irritability as it can distinguish between those who are independently rated by a clinician as irritable, somewhat irritable, and not irritable. Additionally it has been shown to be sensitive to change in a treatment trial, with scores decreasing after treatment. A copy of the Two Week Cranky Thermometer can be found in Appendix C.

Adolescent Measures

Reynolds Adolescent Depression Scale – 2nd Edition (RADS-2: Reynolds, 2002)

The RADS-2 is a widely used measure of depressive symptomatology in adolescents. It is a 30 item self report scale where each item consists of a statement about a symptom and the respondent indicates on a four point Likert scale (ranging from 1=almost never to 4=most of the time) how often they experience each symptom. The item content is the same as the original RADS, with the primary change being the inclusion of four subscales of depression; dysphoric mood, anhedonia/negative affect, negative self evaluation, and somatic complaints. The scale is not designed to be diagnostic, but rather give an indication of the severity of

depressive symptoms a youth is experiencing. There is however, a cut off value of 76 whereby scores above that value are more likely to be obtained by those who are suffering from a depressive disorder (Reynolds, 2002).

The scale has repeatedly been shown to be reliable with internal consistencies between $\alpha = .90$ and $\alpha = .95$ (Weber, 2009). Test-retest reliability checks done on RADS found a coefficient of .80 with six weeks between testing and .79 with three months in between testing (Reynolds, 2002). As the item content of RADS and RADS-2 is identical it can be presumed that these alphas would also be valid for the depression total scale reliability. Extensive validation studies have been undertaken which show support for the validity of RADS-2 as a measure of adolescent depression. Tests of criterion related validity have found scores on RADS-2 to be strongly related to clinical interview ratings of depression using the Hamilton Depression Rating Scale with correlations ranging from $r = .66$, $p < .001$ to $r = .83$ $p < .0001$ (Reynolds, 2002). When testing contrasting groups validity the RADS-2 has been found to accurately distinguish between psychiatric samples suffering from a depressive disorder and school samples (Reynolds, 2002).

The Strengths and Difficulties Questionnaire (SDQ: Goodman, 2001)

The SDQ is a widely used scale that screens for psychopathology in youths aged 3-16 years. The 25 items are statements to which the respondent indicates on a 3-point Likert scale (ranging from 0 = not true to 2 = certainly true) how true each statement is of the child. There are three versions; self report (for 11-16 year olds), parent report, and teacher-report. This study utilised self report and parent report. The questionnaire has five subscales; emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour. The subscales, excluding prosocial behaviour, can be summed to give a

total difficulties score. Those respondents who scores are in the top 10% of total difficulties and the bottom 10% of prosocial behaviour are at much higher risk of mental health problems (Goodman, 2001). Some of the subscales map onto DSM-IV diagnoses, with the 'hyperactivity/inattention' and 'conduct problems' scales representing externalising disorders, and 'emotional problems' scale, internalising disorders.

The scale is reliable with an internal consistency of α = .82 for parent report total difficulties and α = .80 for youth report total difficulties. The internal consistencies of the other subscales are lower, ranging from α = .57 to α = .77 for parent report and α = .41 to α = .67 for youth report (Goodman, 2001). Test-retest reliability in the initial testing by Goodman (2001) was reported as having a mean of r = .62 across informants. In terms of validity Goodman (2001) found significant differences in prevalence of DSM-IV diagnoses between those whose SDQ scores indicated high risk and those who scored in the low risk category. Thus those who scored in the top 10% of the difficulties subscales and the bottom 10% of prosocial behaviour subscale were much more likely to have a psychiatric disorder than those who scored in the normal range. SDQ scores have also been found to accurately discriminate between clinically referred and non-referred children (Achenbach et al., 2008). Additionally SDQ subscale scores correlate quite well with the related Achenbach System of Empirically Based Assessment (ASEBA) scales with correlations ranging from r = .59, p < .001 to r = .87, p < .001 (Goodman & Scott, 1999).

Adult Measures

Liebowitz Social Anxiety Scale (LSAS: Liebowitz, 1987)

The Liebowitz Social Anxiety Scale is a 24 item 4-point Likert scale that asks respondents to rate both their level of fear and their level of avoidance of a range of social situations. The self report version of the scale was developed from a clinician administered

version but has been found to be equivalent (Fresco et al., 2001). It is highly internally consistent for both patients with social anxiety (α = .95) and normal controls (α = .94). It has also demonstrated high levels of convergent validity with other measures of social anxiety and discriminant validity with measures of depression (Fresco et al., 2001).

Generalised Anxiety Disorder Screen (GAD-7: Spitzer, Kroenke, Williams, & Lowe, 2006)

The GAD-7 is a seven item self report measure that screens for generalised anxiety disorder (GAD). The items ask respondents to rate on a 4-point Likert scale (ranging from 0 = not at all to 3 = nearly every day) how often they experience each of the 7 main symptoms of GAD. With a cut-off of 10 the GAD-7 has a specificity of 82% and sensitivity of 89% for generalised anxiety disorder (Kroenke et al., 2007; Spitzer et al., 2006). The GAD-7 is a reliable (α = .89) and valid self report measure of GAD. The GAD-7 scores are able to distinguish between the general population (M=2.97, 95% CI: 2.86-3.07), a clinical population (M = 5.57, 95% CI: 5.33-5.81), and a GAD population (M=14.18, 95% CI: 13.31-15.05) (Lowe et al., 2008). The GAD-7 was designed primarily to screen for GAD but it is moderately good at screening for other anxiety disorders (panic disorder, social anxiety disorder, and posttraumatic stress disorder) (Spitzer et al., 2006).

The Centre for Epidemiologic Studies Depression Scale (CES-D: Radloff, 1977)

The CES-D is a 20 item scale designed to measure depressive symptoms in the general population. Respondents are asked to indicate using a 4-point Likert scale (ranging from 0 = less than one day to 3 = 5-7 days) how often they have felt a particular way in the past week. The items are based on symptoms that are used to make a diagnosis of depression.

The CES-D has high internal consistency of items both in a general population sample (α = .85) and a clinical sample (α = .90). It discriminates well between patient groups and the general population, with 70% of patients and 21% of the general population scoring above cut-off (Radloff, 1977).

The CES-D was chosen as it is one of the most widely used instruments to assess depression in adults. It was preferred over the Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996), another widely used measure, for two reasons. Firstly the adult sample in this study was recruited from the general population and the CES-D was designed for the general population whereas the BDI-II is designed to measure the extent of depressive symptomatology in clinical populations. Secondly as this study aims to compare adults and adolescents a measure of depression that is similar to the RADS-2 was needed to assess adult depressive symptomatology. The RADS-2 is more similar to the CES-D than BDI as it too was designed to measure depressive symptoms in the general population. Additionally, a study comparing several measures of depression found a slightly stronger correlation of r = .78 ($p < .01$) between the CES-D and RADS and than between the BDI and RADS r = .74 ($p < .01$) (Reinecke & Schultz, 1995).

Procedure

School sample

Schools (n = 150) were emailed an advertisement with a brief overview of the project that invited them to contact one of the researchers if they were interested in finding out more about participating in the project. Once a school indicated interest a detailed letter about the project was sent to the Principal along with copies of all the consent forms and questionnaires. The scope of the project was then individually negotiated with each school

(e.g. with some schools only wishing for one class or one year level to participate). At four schools the researcher explained the study to students and gave them a consent form along with an envelope in which to return the completed consent form to take home to parents. Depending on school preference parents were given two weeks to return the materials to either the teacher or they were provided with a reply paid envelope with which to return them directly to the researcher. The researcher collected the returned forms and provided the school with a list of students whose parents had consented to participation. One week later the researcher administered the self report questionnaires (ARI, SDQ, RADS-2, and Cranky Thermometer) to students at the school in a group setting. The consent form asked parents to provide a phone number to be contacted for feedback about their child's scores and so they could complete the parent report questionnaires over the phone. This was completed within two weeks of the child report data being collected. In the other two schools, the school wrote a letter of support for the research that was sent directly to parents along with consent forms and reply paid envelopes. Again parents were given two weeks in which to return the consent forms after which the procedure was identical to that described above.

Clinical Sample

The clinical sample was recruited primarily through the adolescent inpatient unit at a large metropolitan hospital. Hospital staff were briefed about the project and then identified for the researcher patients who fit the criteria for the study. The researcher then spoke to the parents about the research and if they consented approached the young person about participating. The adolescent completed the questionnaires on the ward once informed consent had been obtained from parents and informed assent from adolescents. Parents were given the parent report questionnaires to complete in their own time, and a reply paid envelope in which to return them to the researcher. Up to three reminder calls were given at two weeks, three weeks, and four weeks. Three participants were recruited through an

outpatient unit where the procedure was identical to that followed at the inpatient unit. Three participants were also recruited through a private child psychiatry practice. For these participants the child psychiatrist explained the project to both the adolescent and their parents, emphasising that non-participation would not influence the therapeutic relationship in any way. The forms were then filled out and returned directly to the researcher in a reply paid envelope.

Adult Sample

Adult participants were recruited through advertisements using posters and online advertising primarily through social networking sites. Participants were given the option of following a link to the URL or contacting the researcher for a hardcopy version of the survey to complete. After providing informed consent participants completed the demographic questionnaire, ARI, CES-D, GAD-7, and LSAS. Participants were then given the option of leaving an email address to receive feedback about their scores, a summary of the research findings, and to enter into a prize draw to win one of four $50 department store gift vouchers. The last 40 participants were asked to visit another website after one week to complete the ARI again so that test-retest reliability data could be gathered. These participants were asked to create a unique four digit code so that their questionnaires could be paired while maintaining anonymity. Participants were also given the option of providing an email address so that a reminder email could be sent. Those who provided an email address were sent a reminder one week after their initial participation and a second reminder three days after the first if they had not yet completed the second part. Of the invited participants 32 completed the ARI a second time.

Chapter 4

Paper 1 - Psychometric properties of the Affective Reactivity Index in Australian adults and adolescents

The main aim of this chapter was to provide information regarding the psychometric properties of the ARI which addresses the first aim of the overall thesis. This was considered necessary as using psychometrically sound instruments strengthens the conclusions that can be drawn from any results. While the ARI has previously been validated for use on children and adolescents in the US and UK it was thought appropriate to provide information on the psychometric properties of an Australian sample of adolescents.

There are no items on the ARI that would preclude its use with adults and in discussions with the main author, Stringaris, he indicated that he believed it could be a valid measure of irritability in adults as well as young people. However it was particularly important to establish the psychometric properties of the ARI in the adult sample as this has not been done previously.

The findings in this chapter also address the fifth aim of the thesis as the associations that irritability has with the internalising and externalising subscales of the SDQ are presented.

Monash University

Declaration for Thesis Chapter Four

Declaration by candidate

In the case of Chapter Four, the nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Reviewed literature; designed study, secured ethics; collected, coded and statistically analysed data; prepared paper.	80%

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	**Nature of contribution**	**Extent of contribution (%) for student co-authors only**
Glenn Melvin	Co-investigator, participated in study design, and assisted with preparing and revising the paper.	
Bruce Tonge	Co-investigator, participated in study design, and assisted with preparing and revising the paper.	

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's Signature		**Date**

Main Supervisor's Signature		**Date**

Psychometric properties of the Affective Reactivity Index in Australian adults and adolescents

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Abstract

Background: Irritable mood is implicated in a range of psychiatric conditions in both adults and adolescents. Research into appropriate measures of irritability however has been sparse. Recently Stringaris et al. (2012) published the Affective Reactivity Index (ARI), a measure of chronic irritability with promising psychometric properties. This paper presents psychometric properties of the ARI with Australian adolescents and, for the first time, with adults.

Method: The adolescent sample (n = 396) were recruited from eleven secondary schools in South Eastern Australia. The adult sample (n = 221) were recruited through poster and online advertising. Both samples completed a battery of measures (including the ARI, RADS-2, SDQ, CES-D, GAD-7, and LSAS) on a single occasion, and a subsample of adults (n = 32) completed the ARI a second time after one week to establish test-retest reliability.

Results: Parent and self report scales had excellent internal consistency and correlated well with each other. Test-retest reliability was also very good in the adult sample (ICC = 0.80). Convergent validity was demonstrated as irritability was related to psychopathology in both adults and adolescents as expected.

Conclusions: The ARI is a brief, easy to use scale to measure chronic irritability with promising psychometric properties for use with Australian adults and adolescents.

Keywords: Affective Reactivity Index, irritability, psychometric properties

Psychometric properties of the Affective Reactivity Index in Australian adults and adolescents

Irritability is of interest to researchers and clinicians as it is a symptom of a wide range of psychiatric disorders including both internalising and externalising disorders. Research has found that irritability is contemporaneously associated with both internalising and externalising disorders (Stringaris & Goodman, 2009b; Stringaris et al., 2012). Longitudinal studies however, have revealed that irritability in adolescence is predictive of internalising disorders only, specifically generalised anxiety disorder and depressive disorders (Stringaris & Goodman, 2009a; Stringaris, Cohen, Pine, & Leibenluft, 2009). Irritability may also have important prognostic implications as it has been found, during adolescence, to be independently predictive of suicide (Pickles et al., 2010). Irritability research has been hampered by the lack of an adequate measure. Part of this issue relates to the way in which irritability has been defined.

Though irritable mood features prominently in DSM-5 (APA, 2013) as a symptom or associated feature of many diagnoses the manual provides little guidance as to what constitutes an irritable mood. Previously irritability has been assessed as a component of hostility (Buss & Durkee, 1957) but it has progressed to be a phenomenon assessed in its own right. Without an adequate, agreed upon definition of irritability it is possible that different studies investigating 'irritability' may not actually be measuring the same construct. Thus, caution must be taken when comparing research that has used different tools to assess irritability. DSM-5 (APA, 2013) has taken steps to rectify this issue. The new manual includes a number of cross-cutting symptom measures; one of which is irritability, assessed by the Affective Reactivity Index. Narrow et al. (2013) discuss how the inclusion of standard

assessments for cross-cutting symptoms, including irritability, will enhance clinical research potentially contributing to improved diagnosis of psychopathology.

In research contexts irritability has been measured using both self and other report, paper and pencil questionnaires and interviews. One of the first questionnaires that assessed irritability was the Buss Durkhee Hostility Inventory (1957). However as mentioned above this measure assesses hostility, a related but distinct concept from irritability. Additionally it is quite lengthy and thus may not be practical for use in a clinical setting. Another self report measure, the Irritability, Depression, Anxiety Scale (Snaith, Constantopoulos, Jardine, & McGuffin, 1978), was designed to assess irritability in its own right alongside depression and anxiety. However, the validity of this scale has been questioned as two of the items on the irritability subscale appear to be measuring a self-harm construct (Born & Steiner, 1999; Snaith & Taylor, 1985). The Born-Steiner Irritability Scale (BSIS: Born, Koren, Lin, & Steiner, 2008) includes 14 questions scored on a Likert type scale and seven visual analogue scale items which establish if the current level of irritability is a departure from normal and how irritability has affected several areas of functioning. This scale was however developed specifically for use with women and as such has not been used by researchers who are investigating in both genders. All three of these self report measures were designed for use with adults and as such have no parent report format available. Recent investigations of irritability in children and adolescents (Leibenluft, Cohen, Gorrindo, Brook, & Pine, 2006; Stringaris et al., 2009) have used items contained within diagnostic interviews (e.g. Kiddie Schedule for Affective Disorders and Schizophrenia for School Aged Children, Development and Well-Being Assessment) to ascertain irritability. However, there are only a few items on irritability within such interviews and when administered by clinicians they are costly and time consuming.

To address these issues, and the problem that that there were no paper and pencil questionnaires designed for use with children and adolescents, Stringaris et al. (2012) constructed the Affective Reactivity Index (ARI). This is a brief six-item measure that assesses chronic irritability including impairment of functioning due to irritability. Participants respond on a three-point Likert scale (0 = not true, 1 = somewhat true, 2 = certainly true) how true each statement has been of them over the past six months. The parent report and self report versions are identical aside from the wording of instructions changing from 'your behaviour/feelings' in the self report to 'behaviour/feelings of your child' in the parent report version. The ARI has been used on both a US and a UK sample of adolescents and was found to have excellent internal consistency with Cronbach's alphas ranging from 0.88 to 0.92. Test-retest reliability is unknown at this stage though Stringaris et al. (2012) re-administered the ARI to a small sample approximately one year after initial testing. Parent report ratings of irritability were stable ($r = 0.88$) but self report were not ($r = 0.29$). The authors found the ARI conformed to the single factor structure they had theorised and initial validity investigations were promising. Both parent and self report irritability ratings were lower in healthy volunteers compared to children diagnosed with bipolar disorder (BD) and severe mood dysregulation (SMD). Children with BD also had lower ratings than those with SMD according to parent report (Stringaris et al., 2012). As well as providing evidence for validity, the finding that the ARI can distinguish between diagnoses indicates that perhaps irritability can act as a marker of different types of psychopathology. The data reported by Stringaris et al. (2012) indicate that the ARI is reliable and valid with adolescents in the US and UK, though there are small variations that may be due to cultural differences. Hawes and Dadds (2004) discuss how the Strengths and Difficulties Questionnaire (used in over 40 countries) has slight cultural variations in responding, highlighting the need for measures to be validated for use in different cultures. While the ARI was designed for use with children

and adolescents there are no questions contained within it that would preclude its use with adults.

As discussed, the current measures of irritability available for use with adults are not ideal though irritability is an important symptom experienced by adults as well as children and adolescents. Additionally it may play a role in psychiatric conditions for which it is not a symptom in current diagnostic manuals such as adult depressive disorders. A study in adults with major depressive disorder found that 46% of participants reported experiencing significant irritability in the week preceding the study and that irritability was associated with greater severity of illness (Perlis et al., 2009). Therefore the ARI might also potentially be a valuable tool for the rapid assessment of chronic irritability in adults.

Thus this paper aims to report the psychometric properties of the ARI on a sample of Australian adolescents and also to present the first psychometric data for its use with adults. In addition to the descriptive analysis several hypotheses were made regarding the validity of the measure.

1. It was hypothesised that there would be a single factor structure to the ARI for both parent and adolescent self report versions as found by Stringaris et al. (2012) and that there would also be a single factor structure for the adult self report ARI.
2. It was hypothesised that there would be a positive correlation between the ARI and the irritability item on the Reynolds Adolescent Depression Scale-2 for adolescents and a positive correlation between ARI score and the irritability items on the Generalised Anxiety Disorder Screen, and Centre for Epidemiologic Studies Depression Scale for adults.
3. For adolescents it was hypothesised that convergent validity would be demonstrated through positive associations between irritability (ARI score) and the emotional

problems, conduct problems, and hyperactivity/inattention subscales of the Strengths and Difficulties Questionnaire and a positive correlation between ARI score and the Reynolds Adolescent Depression Scale-2.

4. For adults it was hypothesised there would be a positive correlation between irritability (ARI score), a measure of depressive symptoms, and a measure of generalised anxiety symptoms (of which irritability is a symptom) but not social anxiety symptoms (of which irritability is not a symptom) thus demonstrating both convergent and discriminant validity.

Method

Participants

Data was collected from 396 adolescent participants (59.1% female) aged 11 to 19 years (M = 15.47, SD = 1.88). The majority of these participants (n =232) completed adolescent self report measures only. The parents of the remaining 164 participants were asked to complete parent report measures. Of these three had missing adolescent report ARI data (*n* = 161) and 17 had missing parent report data resulting in 144 complete dyads. These participants were recruited from eleven secondary schools in South Eastern Australia. Socio-economic classes were determined by average household income values and housing costs for each suburb using data from the Australian Bureau of Statistics Census (Australian Bureau of Statistics, 2006). Five of these schools were located in upper middle class suburban areas, two in lower middle class suburban areas, one in an upper middle class rural area, one in a middle class rural area, and two in lower middle class rural areas.

The adult sample consisted of 221 participants (73% female) aged 20 to 58 years (M = 27.19, SD = 8.83) and was recruited through online advertising through social media sites and local council web pages, as well as poster advertisements. Socio-economic classes were

determined by average household income values and housing costs for each suburb in which participants resided using data from the Australian Bureau of Statistics Census (Australian Bureau of Statistics, 2006). Adult participants were recruited from all socio-economic classes, though the upper classes were over-represented (66% lived in relatively advantaged areas, 21% lived in middle class areas, and 13% in relatively disadvantaged areas).

Materials

The Affective Reactivity Index (ARI: Stringaris et al., 2012) is a six item scale designed to measure chronic irritability. The scale also includes an impairment of functioning item, each item is scored on a 3-point Likert scale whereby 0 = not true, 1 = somewhat true, and 2 = certainly true. The scale was designed for use with children and adolescents and in this population has been found to have promising psychometric properties as discussed earlier. Both parent report and self report versions were used in the current study.

Adolescent Measures

The Strengths and Difficulties Questionnaire (SDQ: Goodman, 2001) is scale designed to measure general psychological well-being in children and adolescents. It consists of 25 items scored on a 3-point Likert scale where 0 = not true, 1 = somewhat true, and 2 = certainly true. The measure has five subscales; emotional problems, peer relationship problems, hyperactivity/inattention, conduct problems, and prosocial behaviour. The scale has been found to be reliable with an internal consistency of $\alpha = .82$ for parent report total difficulties and $\alpha = .80$ for youth report total difficulties (Goodman, 2001). The internal consistencies of the other subscales are lower, ranging from $\alpha = .57$ to $\alpha = .77$ for parent report and $\alpha = .41$ to $\alpha = .67$ for youth report (Goodman, 2001). Validity has also been demonstrated as SDQ scores have been found to accurately discriminate between clinically referred and non-referred children (Achenbach et al., 2008).

The Reynolds Adolescent Depression Scale-2 (RADS-2: Reynolds, 2002) is a 30 item Likert type scale designed to measure the level of depressive symptomatology in the general population of adolescents. The scale has repeatedly been found to be reliable with alpha coefficients ranging from 0.90 to 0.95 (Weber, 2009). Scores on the RADS-2 are related to clinical interview ratings of depression using the Hamilton Depression Rating Scale with correlations ranging from r = 0.66, $p < .001$ to r = 0.83 $p < .0001$ (Reynolds, 2002).

Adult Measures

The Centre for Epidemiologic Studies Depression Scale (CES-D: Radloff, 1977) is a 20 item Likert type scale designed to measure the level of depressive symptomatology in the general population. The measure has been found to have high internal consistency ($\alpha = 0.85$) and can discriminate well between patient groups and the general population, with 70% of patients and 21% of the general population scoring above cut-off (Radloff, 1977). The CES-D also correlates highly with the RADS-2 ($r = 0.78$) (Reinecke & Schultz, 1995).

The Generalised Anxiety Disorder Screen (GAD-7: Spitzer, Kroenke, Williams, & Lowe, 2006) is a brief 7-item scale that screens for generalised anxiety disorder (Kroenke, Spitzer, & Williams, 2007). Respondents are asked to indicate on a Likert scale (ranging from 0 = not at all to 3 = nearly every day) how often over the past week they have experienced each of the 7 primary symptoms of GAD. It has been found to be internally consistent ($\alpha = 0.89$) and can distinguish between a GAD sample, a clinical sample, and a healthy sample (Lowe et al., 2008).

The Liebowitz Social Anxiety Scale (LSAS: Liebowitz, 1987) is a 24 item self report scale that is designed to measure social anxiety symptoms. The scale asks respondents to rate on a 4-point Likert scale both the level of fear and avoidance they would experience in a range of social situations. The LSAS was found to have a high level of internal consistency (α

= 0.95) and correlates well (r = 0.61) with the Social Phobia Scale (Fresco et al., 2001; Heimberg et al., 1999).

Procedure

For the adolescent sample, consent forms were sent home to parents at participating schools. The research was explained to students with parental consent who could then choose to participate or not. Questionnaires were administered in a group setting during school hours. After the self report questionnaires were administered, parents were called and the parent report questionnaires were administered over the phone. Parents were recontacted about their child's scores on the questionnaires if they were above clinical cut off and provided with advice regarding further assessment/treatment as necessary.

The adult sample was directed to a website where they were able to complete the questionnaires online. They were given the option of providing an email address should they wish to receive feedback about their scores and/or enter a prize draw to win one of four department store vouchers valued at $50 each, or they could choose to remain anonymous. The last 40 participants were asked to visit another website after one week to complete the ARI again so that test-retest reliability data could be gathered. Those who provided an email address were sent a reminder one week after their initial participation and a second reminder three days after the first if they had not yet completed the second part. Of the invited participants 32 completed the ARI a second time.

Statistical Analysis

The temper tantrum item was removed from the SDQ conduct problems subscale for all analyses as it is identical to an item on the ARI. In addition to the adolescent dyads (n = 161) the data from participants with just adolescent report measures (n = 232) was used to calculate internal consistency and the confirmatory factor analysis. All other adolescent

analyses used the data from the remaining adolescent participants (*n* = 161). Pearson's correlations were conducted to explore the relationship between age and ARI total score. Gender differences and differences between adult and adolescent self report, and between parent and adolescent report were examined using t-tests. Test-retest reliability was calculated using intra-class correlations with a subgroup that was representative (n = 32) of the adult sample who completed the ARI one to two weeks (m = 8.63 days, SD = 1.56 days) after initial testing. Internal consistency was calculated using Cronbach's alpha. Item and total means were calculated for the ARI and comparisons were made between reporting source using repeated measures t-tests.

To test hypothesis one, the single factor structure of the ARI was tested by confirmatory factor analysis in Stata v.12 using maximum likelihood estimation as recommended by Tabachnick and Fidell (2007). Model fit was tested with the comparative fit index (CFI) where values above 0.95 are indicative of good fit and root mean square error of approximation (RMSEA) where values below 0.06 are indicative of good fit (Tabachnick & Fidell, 2007). Separate models were estimated for parent report ARI, adolescent report ARI, and for adult self report ARI. Participants with missing data were excluded from the model estimation.

To test hypothesis two, Pearson's correlations were conducted between the ARI and the irritability item on the RADS-2, the irritability item on the CES-D, and the irritability item on the GAD-7.

To test the third hypothesis Pearson's correlations were conducted between the ARI, the RADS-2, and each of the SDQ subscales. Additionally regression models were estimated. In each regression model one of the SDQ subscales (emotional problems, conduct problems, or hyperactivity) was the outcome variable. The total ARI score as well as each of the SDQ

subscales of interest that were not being used as the outcome measure were entered as predictors all at once. Cross-informant correlations were also conducted between the ARI and SDQ subscales and cross-informant regression models were estimated with the adolescent self report ARI total score predicting parent report SDQ subscale scores and vice versa.

To test hypothesis four, Pearson's correlation were conducted between the ARI and the GAD-7, CES-D, and LSAS. There was a high degree of inter-correlation between the measures of depression and anxiety. Thus separate regression models were estimated for each measure with ARI total as the predictor.

Results

Descriptive Statistics

There were no significant differences on ARI total score according to gender for parent report, adolescent self report, or adult self report and Pearson's correlation revealed no relationship between age and ARI total score. There was a significant difference between the mean ARI score for adults (M = 2.41, SD = 2.18) and the adolescent self report mean ARI score (M = *1*.96, SD = 2.25) t (380) = -1.96, p = 0.05. There was also a significant difference between mean parent reported ARI total score (M = 2.46,SD = 2.51) and adolescent self report mean ARI total (t (143) = 2.26, $p < 0.05$). The item with the highest mean score by both parent and self report was 'easily annoyed by others' while the items concerning anger had lower mean scores. Repeated measures t-tests revealed the only significant difference between parent and adolescent self report between item means were for the items 'often loses temper' (t (143) = 3.89, $p < 0.01$) and 'loses temper easily' (t (143) = 2.54, $p < 0.05$). Test-retest reliability was assessed using intra-class correlations with a subsample of adults. The ICC for ARI total was 0.80 (95% CI 0.59 to 0.90). The Cronbach alpha coefficient of the

adult self report ARI $\alpha = 0.80$, and for adolescent self report was $\alpha = 0.85$. The Cronbach alpha coefficient for the parent report ARI was $\alpha = 0.80$.

Hypothesis 1

Confirmatory factor analysis was conducted on the parent report and self report ARI. The single factor structure proposed by Stringaris et al. (2012) was confirmed as an adequate description for parent report data (CFI = 1.00, RMSEA = 0.00), while the single factor model was not a good fit for the adolescent self report data (CFI = 0.95, RSMEA = 0.12) or the adult self report data (CFI = 0.91, RMSEA = 0.13). Investigation revealed that for both adult and adolescent self report data there was a high level of covariance between item 2 (often loses temper) and item 6 (loses temper easily). Removing item 6 from the model resulted in a better fit for adolescents (CFI = 0.98, RSMEA = 0.08) but removing item 2 resulted in the best fit which was an adequate description of the data (CFI = 0.99, RMSEA = 0.05). While for adults removing item 2 from the model resulted in a better fit (CFI = 0.99, RMSEA = 0.05) but removing item 6 resulted in the best fit which was an adequate description of the data (CFI = 1.00, RSMEA = 0.03). The factor loadings for each item can be found in Table 1.

Hypothesis 2

The correlations between the RADS-2 irritability item, adolescent self report ARI ($r = 0.50$, $p < 0.01$), CES-D irritability item and adult self report ARI ($r = 0.29$, $p < 0.01$), and GAD-7 irritability item and adult self report ARI ($r = 0.59$, $p < 0.01$) were all significant.

Table 1

Mean Scores and Factor Loadings for the ARI Items for Parent Report, Adult Self Report and Adolescent Self Report

	Mean (SD)			**Factor 1 Score**				
	Parent (n = 146)	Adolescent (n = 161)	Adult (n = 221)	Parent	Adult	Adolescent	Adult[a]	Adolescent[b]
Easily annoyed by others	0.79 (0.72)	0.71 (0.65)	0.90 (0.65)	0.65	0.56	0.54	0.62	0.54
Often lose temper	0.59 (0.70)	0.34 (0.55)	0.36 (0.54)	0.78	0.66	0.80	0.55	--
Stay angry for a long time	0.16 (0.45)	0.25 (0.49)	0.40 (0.58)	0.27	0.38	0.55	0.42	0.59
Angry most of the time	0.09 (0.31)	0.07 (0.30)	0.11 (0.33)	0.49	0.54	0.60	0.59	0.65
Get angry frequently	0.36 (0.57)	0.27 (0.52)	0.30 (0.51)	0.78	0.77	0.79	0.78	0.83
Lose temper easily	0.47 (0.67)	0.32 (0.53)	0.35 (0.54)	0.82	0.73	0.79	--	0.70

[a] Factor loadings after item 2 was removed from the model.

[b] Factor loadings after item 6 was removed from the model.

Table 2a

Pearson's Correlations ARI total and SDQ Subscales (parent report measures are above the diagonal and cross-informant correlations between parent and child measures are on the diagonal)

	ARI total	**Emotional**	**Conduct**	**Hyperactivity**	**Peer Problems**	**Prosocial**
ARI total	***.42****	.36**	.35**	.46**	.10	-.39**
Emotional	.37**	***.53****	.27**	.28**	.38**	-.08
Conduct	.40**	.27**	***.43****	.40**	.16	-.25**
Hyperactivity	.33**	.38**	.36**	***.43****	.01	-.30**
Peer Problems	.36**	.44**	.19*	.19*	***.23****	-.18
Prosocial	-.15	-.20	-.33**	-.24**	-.10	***.25****

**$p < 0.01$, *$p < 0.05$

Table 2b

Cross-Informant Correlations between ARI Total and SDQ Subscales

	Emotional	**Conduct**	**Hyperactivity**	**Peer Problems**	**Prosocial**
ARI total					
Parent report	0.27**	0.29**	0.24**	0.10	-0.01
Adolescent report	.40**	0.15	0.26**	0.12	-0.03

Note. ARI, Affective Reactivity Index.

**$p < 0.01$, *$p < 0.05$

Hypothesis 3

In the adolescent sample Pearson's correlations indicated that there were moderate to strong relationships between ARI total and all of the SDQ scales except for the peer relationship problems subscale by parent report, and the prosocial behaviour subscale by self report (Table 2a). Cross-informant correlations revealed moderate correlations between parent report ARI scores and self reported SDQ subscales except for peer relationship problems and prosocial behaviour. Adolescent self reported ARI scores however, were only related to parent reported emotional problems and hyperactivity (Table 2b). Fisher's test revealed that the relationship between adolescent self report ARI scores and parent report emotional problems was stronger than the relationship with hyperactivity (z = -1.32, p < 0.01). Multivariate regression models show that, by parent report, irritability predicted emotional problems, conduct problems and hyperactivity. By adolescent self report irritability predicted conduct problems and emotional problems but not hyperactivity (Table 3a). Cross-informant regression models revealed that parent reported ARI scores were predictive of adolescent reported emotional and conduct problems but that adolescent reported ARI scores were only predictive of parent reported emotional problems (Table 3b).

Hypothesis 4

Pearson's correlations revealed moderate to strong associations between the ARI, depression measures, and anxiety measures, including social anxiety (Table 4). The regression analyses revealed a strong relationship between the ARI and measures of anxiety. Additionally there was a strong association between ARI scores and depression scores for both adults and adolescents.

Table 3a

Regression of ARI Total and Each of Three SDQ Subscales (Emotional, Conduct, & Hyperactivity) on the Two Remaining SDQ Subscales

	Parent (*n* = 146)			**Self (*n* = 164)**		
Predictors	Emotional	Conduct	Hyperactivity	Emotional	Conduct	Hyperactivity
ARI total	0.24**	0.06*	0.33***	0.26**	0.09*	0.06
Hyperactivity	0.09	0.11**	n/a	0.33**	0.14**	n/a
Conduct	0.33	n/a	0.69**	0.19	n/a	0.56**
Emotional	n/a	0.05	0.09	n/a	0.03	0.27***

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Table 3b

Cross-Informant Beta Coefficients between ARI total and SDQ subscales

	Emotional	**Conduct**	**Hyperactivity**	**Peer Problems**	**Prosocial**
Parent report ARI total	.21*	.60**	.11	-.08	.24
Adolescent report ARI total	.35***	-.01	.15	-.01	.06

Table 4

Correlations and Beta Coefficients between the ARI and Measures of Depression and Anxiety

	ARI total		CES-D total	GAD-7 total
	r	**β**	***r***	***r***
Adult				
CES-D total	0.42**	0.08**	-	-
GAD-7 total	0.44**	0.20**	0.80**	-
LSAS total	0.31**	0.03**	0.53**	0.53**
Adolescent				
RADS-2 total	0.49**	0.08**		

Note. ARI, Affective Reactivity Index; RADS-2, Reynolds Adolescent Depression Scale-2; CES-D, Centre for Epidemiologic Studies Depression Scale; GAD-7, Generalised Anxiety Disorder Screen; LSAS, Liebowitz Social Anxiety Scale.

** $p < 0.01$

Discussion

This paper has reported the psychometric properties of the Affective Reactivity Index (Stringaris et al., 2012), a measure of irritability designed to be brief and easy to use, with Australian adolescents and, for the first time, with an adult sample. The mean ARI total score for adolescents by both parent and self report was higher than that reported in Stringaris et al.'s (2012) healthy volunteer sample, but lower than their clinical sample. The mean ARI total score for adult self report was significantly higher than that for adolescent self report. The highest mean score for any item by parent report, adolescent self report and adult self report was 'easily annoyed by others' while the lowest mean score by parent report, adolescent self report and adult self report was 'angry most of the time'. This is consistent

with Stringaris et al.'s findings. Also consistent with the work of Stringaris et al. is that there were no differences according to gender.

The ARI has a high level of internal consistency for both adults and adolescents regardless of reporting source. In terms of test-retest reliability, there was a high level of agreement between ratings by adults on the ARI one week apart. There is a good level of agreement between parent report and adolescent self report, similar to that of the SDQ, a psychometrically robust measure (Hawes & Dadds, 2004).

There were mixed results regarding the confirmatory factor analysis. As hypothesised the parent report data fitted the six item single factor model well however, contrary to the hypothesis, adolescent and adult self report did not. Investigations revealed that for both the adults and adolescents there was a high level of covariance between the items 'often loses temper' and 'loses temper easily'. For adults the best fit was found when the item 'loses temper easily' was removed from the model. For adolescents the best fit was found when the item 'often loses temper' was removed from the model. Stringaris et al. (2012) described the six-item single factor model as having an adequate fit with their self report data (RSMEA = 0.09, 0.21). The findings in the current study also had RMSEA above the recommended 0.06 (Tabachnick & Fidell, 2007). This suggests that for the self report version of the ARI there may be item redundancy with the items 'often loses temper' and 'loses temper easily'. However, these two items aim to measure different concepts – frequency and threshold. These are also the two items with means that differed significantly between parent report and adolescent self report. Thus it appears as though respondents may have difficulty distinguishing between these items when reporting about themselves but not when reporting on someone else.

The hypothesis that there would be an association between the ARI and the irritability items on the measures of depression and anxiety was confirmed thus providing evidence of validity. Further work is needed to establish how well the ARI correlates with other measures of irritability such as clinician rated irritability. Significant associations were found in the adolescent sample between the ARI and RADS-2 and most of the subscales of the SDQ. The correlations were quite similar across internalising (emotional problems) and externalising (conduct problems, and hyperactivity/inattention) subscales. These results are perhaps what one would expect from a symptom such as irritability, which is unusual in that it crosses the internalising/externalising divide. This is also consistent with past research that has found irritability is cross-sectionally associated with both internalising and externalising problems (Stringaris & Goodman, 2009b; Stringaris et al., 2012). A regression analysis demonstrated that adolescent report irritability scores are associated with both the conduct problems subscale and the emotional problems subscale, though the association was stronger with emotional problems. While parent report irritability scores were associated with emotional problems, conduct problems and hyperactivity/inattention with the strongest association with hyperactivity/inattention. This differs from Stringaris et al. (2012) as they did not find a relationship between irritability and conduct problems by parent report though the other results are similar. Additionally Stringaris et al. (2012) did not include hyperactivity as an outcome variable. The findings reported in this paper show that while irritability is cross-sectionally associated with both internalising and externalising problems the association with externalising problems may be stronger. Perhaps this is reflective of actual differences between Australian adolescents and those from the UK.

This study further extends upon the work of Stringaris et al. (2012) as they do not include any cross-informant data. Significant correlations were found between the ARI and cross-informant SDQ subscales. The parent report ARI was correlated with adolescent

reported emotional problems, conduct problems, and hyperactivity/inattention. Whereas the adolescent report ARI scores were correlated with parent reported emotional problems and hyperactivity/inattention. The regression analysis revealed that parent reported ARI scores were strongly associated with adolescent reported conduct problems and, to a lesser extent, emotional problems. While the adolescent reported ARI score was associated only with parent reported emotional problems. These results provide further support for the validity of the ARI as scores are associated across informants with both internalising and externalising symptoms.

The hypothesis that in adults ARI total scores would be associated with a measure of depressive symptoms and a measure of generalised anxiety was supported though surprisingly there was also a positive association between ARI total scores and social anxiety scores. There was a moderately strong correlation between generalised anxiety and social anxiety scores which may partially explain this relationship. Additionally social anxiety disorder tends to have high rates of co-morbidity with other disorders for which irritability is a symptom (e.g. generalised anxiety disorder, bipolar disorder) (Grant et al., 2005; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992).

The study had several limitations that can be addressed in future research primarily relating to sample sizes and composition. Test-retest reliability had a small sample size and was only available for adults. Only a subsample of adolescents had parent report measures and the number of parents was only just within the acceptable bounds for factor analysis (Tabachnick & Fidell, 2007). The majority of the adults fell into the category of young adults, rather than being representative of all the years adulthood encompasses. Different measures were used for depression in adolescents and adults, which limits the validity and utility of comparisons between these symptoms.

The ARI shows great potential as a brief, easy to use scale to measure chronic irritability in research contexts. It has been shown to be reliable and valid for use with Australian adolescents as well as adolescents from the US and UK (Stringaris et al., 2012). It is also a reliable measure of irritability in adults and the initial validity work presented here is promising. The ARI may prove to be useful for clinical studies as well, so future research should evaluate the clinical utility of the scale and whether it is sensitive to change.

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Chapter 5

Paper 2 – Irritability and psychopathology: A comparison between adults and adolescents

This chapter provides data regarding the developmental trajectory of irritability. It addresses the second and third aims of the thesis which involve comparisons of irritability and its clinical correlates between adults and adolescents. This chapter provides data to answer the question of whether adolescents are more irritable than adults. It also provides, for the first time, a direct comparison of the association irritability has with depressive symptoms between adults and adolescents. There is also some data that addresses the fifth aim of the thesis as the associations that irritability, as measured by the Cranky Thermometer, has with the internalising and externalising subscales of the SDQ are presented.

Monash University

Declaration for Thesis Chapter Five

Declaration by candidate

In the case of Chapter Five, the nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Reviewed literature; designed study, secured ethics; collected, coded and statistically analysed data; prepared paper.	80%

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	**Nature of contribution**	**Extent of contribution (%) for student co-authors only**
Glenn Melvin	Co-investigator, participated in study design, and assisted with preparing and revising the paper.	
Bruce Tonge	Co-investigator, participated in study design, and assisted with preparing and revising the paper.	

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's Signature		**Date**

Main Supervisor's Signature		**Date**

Irritability and psychopathology: A comparison between adolescents and adults

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Running Head: Irritability and psychopathology

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Abstract

Objective: The developmental trajectory of irritability has not been adequately studied. The authors compared the level of irritability and the association irritability has with depressive symptoms between adolescents and adults.

Method: Adolescents (N = 164) were recruited from secondary schools and adults (N = 221) through the use of posters and online advertising. Participants completed a test battery that assessed irritability (including an item enquiring about impairment associated with irritability), depressive symptoms, anxiety symptoms, and general psychological wellbeing.

Results: The adults reported higher irritability than the adolescents. Adults who reported impairing irritability were also significantly more likely to have mean scores above the clinical cut off values on the depression and anxiety screens. Irritability was strongly associated with depressive symptoms in both adolescents and adults and with anxiety symptoms in adults.

Conclusions: The widely held belief that adolescents are more irritable than adults may not be true, though it was found that adolescents were more prone to experience impairing irritability in the absence of categorical mental health disorders than young adults. These results indicate that irritability may be a salient feature of adult depressive disorders as well as childhood and adolescent depressive disorders.

Keywords: irritability, psychopathology, depression

Irritability and psychopathology: A comparison between adults and adolescents

Irritability is a mood that is a symptom of a range of psychiatric disorders (APA, 2013) and is a risk factor for internalising disorders (Stringaris and Goodman, 2009a;n Stringaris et al., 2009) and suicide (Pickles et al., 2010). Irritability has been defined as 'easy annoyance and touchiness, [that] is characterised by the emotion of anger, and temper outbursts can be its behavioural manifestation' (Stringaris, 2011: 61). During the past decade there has been an increase in research investigating irritability in children and adolescents partially driven by the preponderance of youths in the US receiving diagnoses of bipolar disorder (Danner et al., 2009). Leibenluft et al. (2003) discuss how this increase in diagnoses is in part due to a subset of children who do not fit the classic bipolar disorder presentation. These authors identified four 'phenotypes' of bipolar disorder, one of which, the 'broad phenotype', consists of children experiencing extreme, chronic irritability and hyperarousal. The authors do not believe that this presentation is a form of bipolar disorder and subsequently labelled it Severe Mood Dysregulation (SMD) in order to distinguish it from bipolar disorder. In DSM-IV there is no diagnostic place for those children who present with severe, chronic irritability thus these children may be receiving a diagnosis of bipolar disorder in order to receive funding for treatment (Danner et al., 2009). Subsequently there has been an increasing amount of research into irritability and these two conditions which has led to the inclusion of a new disorder, Disruptive Mood Dysregulation Disorder (DMDD), in DSM-5. DMDD is based on SMD but does not have the hyperarousal symptoms.

Due to the pediatric bipolar disorder controversy recent studies about the nature of irritability have focussed on children and adolescents. Irritability is considered a developmentally sensitive mood, as is reflected in the widely held belief that people are more irritable during adolescence than at any other stage in their lives (Buchanan et al., 1992). A review of the

literature on the development of irritability was conducted using keyword, abstract, and title information in PsycINFO and MEDLINE (R). The search used combinations of the terms 'irritability', 'irritable mood', 'anger', and 'developmental', 'trajectory', 'life span', 'life course'. In addition reference lists from relevant articles were consulted to identify further items. Only English language articles published under peer-review were included. A study was included if it mentioned change (or lack of) in irritability or anger according to age. This resulted in four articles about anger (Beaudreau et al., 2009; Lucas and Gohm, 2000; Schieman, 2003; Weinder and Graham, 1989) and four studies about irritability (Al Jurdi et al., 2012; Fichter et al., 2009; Leibenluft et al., 2006; Perlis et al., 2005). The anger studies all reported that anger has a negative relationship with age (Beaudreau et al., 2009; Lucas and Gohm, 2000; Schieman, 2003; Weiner and Graham, 1989). The irritability studies reported more complicated findings. One reported that younger adults with depression were more likely to experience irritability than older adults with depression (Perlis et al., 2005). Another reported that younger and older adults with bipolar disorder experience comparable levels of irritability (Al Jurdi et al., 2012). The remaining two studies concerned community samples. Fichter et al. (2009) assessed irritability during childhood and adolescence and at an 18 year follow up irritability levels had significantly decreased. Leibenluft et al. (2006) followed a sample of adolescents over the course of nine years and reported that episodic irritability increased with age. While chronic irritability had an inverse curvilinear relationship with age so that it increased in early adolescence, peaking around ages 14-16, and declined in late adolescence. Thus there is limited evidence addressing the belief that adolescents are more irritable than adults. Leibenluft et al. (2006) also found a significant gender difference, with females reporting higher levels of both chronic and episodic irritability. However, other studies have found no relationship between gender and irritability (Fichter et al., 2009; Stringaris et al., 2012).

The developmentally sensitive nature of irritability is also demonstrated in DSM-5 with irritability included as a symptom of childhood and adolescent, but not adult, depressive disorders. The inclusion of irritability as a symptom of childhood and adolescent depressive disorders was not based on empirical evidence (Kessler et al., 2001). However, research since its inclusion has supported this decision as several studies of youth depression have found over 80% of children and adolescents with depressive disorders experience irritability (Crowe et al., 2006; Masi et al., 2001; Stewart et al., 2002). Despite irritability not being included as a symptom of depressive disorders in adults there is evidence to suggest that it is a relevant symptom in this age group as well. Perlis et al. (2009) found 46% of adults suffering Major Depressive Disorder reported experiencing irritability. This study also found irritability to be associated with increased severity of illness and co-morbid anxiety, perhaps due to irritability being a symptom of several anxiety disorders. The review of the literature did not find any research published that compares irritability in the context of depressive disorders between adolescents and adults without which it is difficult to conclusively say what role irritability actually plays in depressive disorders. Thus in order to fully understand irritability and its developmental trajectory it is important that irritability and the associations it has with psychiatric conditions, in particular depressive disorders, is studied across the lifespan.

As such this paper has two broad aims; firstly to directly compare the level of irritability and the level of impairment of functioning associated with irritability between adolescents and adults. Secondly to compare the associations irritability (and impairment associated with irritability) has with depression and anxiety between adolescents and adults. It is hypothesised that adolescents will report higher levels of irritability than adults. It is further hypothesised that there will be a relationship between irritability and depressive symptoms in adults but that the relationship between irritability and depressive symptoms will be stronger in adolescents.

Method

Participants

The adult sample consisted of 221 participants (161 females) aged between 20 and 58 years (mean = 27.19 years, SD = 8.83) recruited through posters and online advertising. Socioeconomic status (SES) was estimated using the Index of Relative Socioeconomic Disadvantage (IRSD) developed by the Australian Bureau of Statistics from data collected in the 2006 census (Australian Bureau of Statistics, 2006). After the census each postcode in Australia is assigned an IRSD value based on a combination of factors including educational level, employment status, income, and motor vehicle ownership of residents. Five SES brackets were created for participants in the current study; group I comprised participants in the highest IRSD (deciles 9 & 10, least disadvantaged), group II (deciles 7 & 8), group III (deciles 5 & 6), group IV (deciles 3 & 4), and group V (deciles 1 & 2, most disadvantaged). Adult participants were recruited from all socioeconomic classes through the least disadvantaged classes were over-represented (50% group I, 32% group II, 9% group III, 3% group IV, and 6% group V).

The adolescent sample consisted of 164 participants (mean = 15.77 years, SD = 1.96) with 105 females recruited through six secondary schools, both public and private, located in Southeast Australia. Three of these schools were located in a group I area, one in a group II area, one in a group III area, and one in a group IV area. Eighteen participants did not have parent report data resulting in 146 complete dyads. The study protocol received ethics approval from the local research ethics review board. After complete description of the study to the subjects, written informed consent was obtained.

Materials

Irritability Measures. The Affective Reactivity Index (Stringaris et al., 2012) is a six item scale that assesses the level of irritability a person has experienced over the past six months. There is an additional item that assesses impairment of functioning due to irritability. The scale has good psychometric properties for both self report and parent report formats (Stringaris et al., 2012). This measure was designed for use with adolescents but there are no questions that would preclude its use with adults. Initial work demonstrates the scale also has good internal consistency ($\alpha = 0.80$) and test-retest reliability (ICC = 0.80) with adults (Mulraney et al., submitted).

The Cranky Thermometers are visual analogues scales that measure current level of irritability, peak irritability in the past two weeks, and peak irritability ever. Peak irritability over the past two weeks has the most robust psychometric properties with a test-retest intraclass correlation of 0.64 and the ability to discriminate between respondents independently rated by a clinician as irritable, somewhat irritable, and not irritable (unpublished data). As such only this thermometer was used in the current study.

Adolescent Measures. The Reynolds Adolescent Depression Scale-2 (RADS-2) (Reynolds, 2002) consists of 30 items measuring a range of depressive symptoms. The scale has excellent psychometric properties (Reynolds, 2002; Reynolds and Mazza, 1998). The RADS-2 has a cut-off value whereby scores above 76 are indicative of possible depressive disorder.

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 2001) is a measure of general psychological well-being with good psychometric properties (Goodman, 2001). It consists of five subscales; prosocial behaviour, emotional problems, conduct problems, hyperactivity/inattention, and peer relationship problems. The latter four subscales are summed to form a total difficulties scale. The measure has both parent- and self-report

formats which were utilised in the current study. Scores of 20 and above on the total difficulties subscale indicate the young person may be experiencing mental health problems.

Adult Measures. The Centre for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977) is a 20 item scale that was designed to measure the level of depressive symptomatology in a general population. It has excellent psychometric properties (Radloff, 1977) and correlates well with the RADS-2 (Reinecke and Schultz, 1995). The CES-D has a cut off value whereby scores of 16 or higher are indicative of possible depressive disorder.

The Generalized Anxiety Disorder Screen (GAD-7) (Spitzer et al., 2006) is a brief scale with good psychometric properties (Kroenke et al., 2007) that asks respondents to indicate how often over the past week they have experienced each of the seven primary symptoms of generalised anxiety disorder. The GAD-7 was designed primarily to screen for generalised anxiety disorder but it is reasonably good at screening for other anxiety disorders (panic disorder, social anxiety disorder, and post-traumatic stress disorder). A cut-off value of 10 indicates the need for further evaluation (Spitzer et al., 2006).

The Liebowitz Social Anxiety Scale (LSAS) (Liebowitz, 1987) asks respondents to rate on a 4 point Likert scale the level of fear they would experience and how often they would avoid 24 potentially anxiety provoking situations. It has good psychometric properties and correlates well with the clinician rated version of the scale (Fresco et al., 2001). The LSAS has a cut-off value so that scores of 55 or higher are indicative of probably social anxiety disorder.

Procedure

Parental consent was obtained for the adolescent sample after which the questionnaires were administered in a group setting during school hours. Parent report measures were completed

over the phone after the self report data had been gathered. The adult sample had self report data only and this was gathered via an online questionnaire.

Statistical Analysis

Means and standard deviations were calculated for the irritability measures to provide descriptive data. As there were differing levels of depressive symptomatology between the groups a regression analysis was conducted to test group differences in irritability after controlling for depression scores. A two way analysis of variance (ANOVA) was conducted to explore the impacts of sex and age on each of the irritability measures.

A regression analysis was conducted to determine the association between the Cranky Thermometer and each of the other measures. The sample was then split into three groups according to response to the impairment item on the ARI (not true, somewhat true, and certainly true). A one way ANOVA was conducted to test differences between the impairment groups on each of the other measures. The alpha level was set at 0.01 to correct for multiple comparisons and Scheffe's test was used to conduct post hoc analyses.

Results

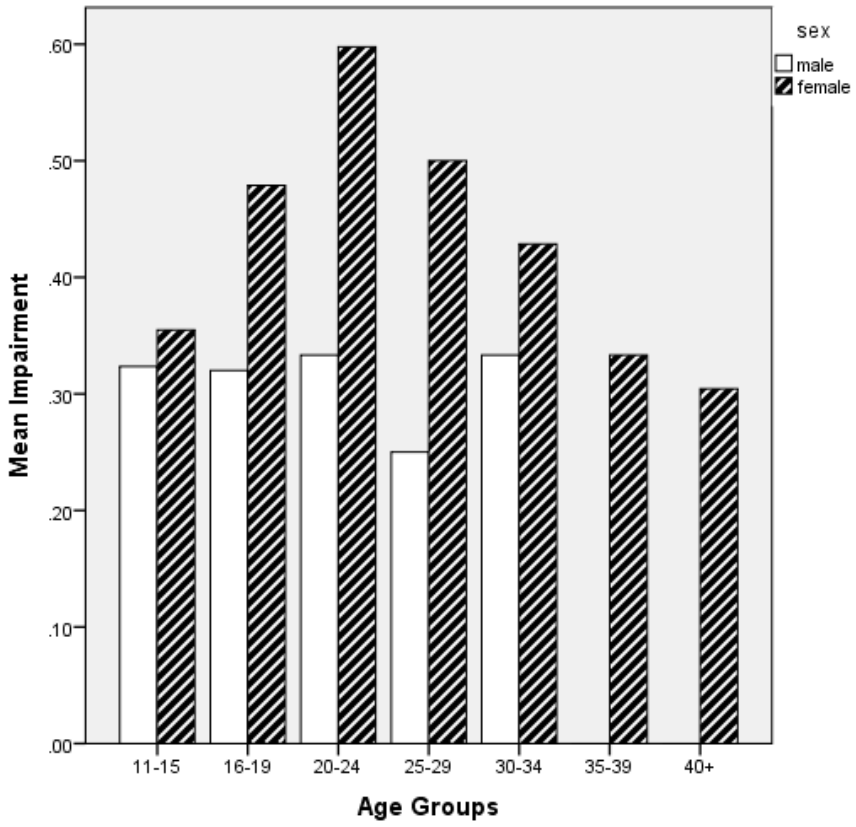
The mean Cranky Thermometer scores were similar for adults (M = 63.39, SD = 26.37) and for adolescents (M = 61.81, SD = 26.53). The difference between adolescent self-report ARI total (M = 1.96, SD = 2.25) and parent-report ARI total (M = 2.45, SD = 2.50) means was significant (t (143) = 2.26, $p < 0.05$). There was a significant difference between adult self report ARI total scores (M = 2.41, SD = 2.18) and adolescent self report ARI total scores, even after controlling for depression scores (B = 1.18, 95% CI 0.90 to 1.46). In terms of the impairment item 8.7% of adults responded that irritability certainly impairs their functioning, while a further 26.7% stated this to be somewhat true. In comparison 10.2% of the adolescents reported that their functioning was certainly impaired, with a further 29.7%

indicating this to be somewhat true by self-report. A Chi-square test for independence indicated no difference between adults and adolescents in impairing irritability (χ^2 (2, N = 382) = 0.97, p = 0.62).

Pearson's correlations revealed no relationship between age and the irritability measures (ARI total, ARI impairment item and Cranky Thermometer). The ARI total scores were fairly uniform across the age distribution of both genders. The distribution of the problem item however revealed that men aged 35+ (n = 4) did not report any impairment due to irritability (Figure 1). The two-way between-groups ANOVAs revealed a trend toward women reporting greater impairment of functioning due to irritability (F (3, 608) = 3.64, p = 0.057) and a trend toward adult men reporting a lower level of impairment due to irritability than adult women or adolescents (F (3, 608) = 3.19, p = 0.075), as can be seen in Figure 1.

Figure 1

Distribution of Impairing Irritability across Age Groups According to Gender



Regressions were conducted with the Cranky Thermometer as a predictor for each of the other measures of psychological functioning. As can be seen in Table 1 all of the associations between irritability and psychological functioning are highly significant with the exception of prosocial behaviour.

Table 1

Associations between Irritability and Measures of Mental Illness

	The Cranky Thermometer		**The Affective Reactivity Index^**	
	B	95% CI	B	95% CI
Adult measures				
GAD-7	0.09***	0.07 to 0.11	0.97***	0.70 to 1.24
LSAS	0.34***	0.22 to 0.46	3.42***	1.95 to 4.89
CES-D	0.19***	0.14 to 0.24	2.15***	1.51 to 2.79
Youth measures				
RADS-2	0.22***	0.15 to 0.29	2.83***	2.35 to 3.31
SDQ total	4.46***	3.27 to 5.64		
SDQ emotional	0.03***	0.02 to 0.05		
SDQ conduct	0.02***	0.01 to 0.03		
SDQ peer	0.01*	0.00 to 0.02		
SDQ hyper	0.03***	0.02 to 0.05		
SDQ prosocial	-0.00	-0.01 to 0.00		

RADS-2, Reynolds Adolescent Depression Scale-2; CES-D, Centre for Epidemiologic Studies Depression Scale; GAD-7, Generalized Anxiety Disorder Screen; LSAS, Liebowitz Social Anxiety Scale; SDQ, Strengths and Difficulties Questionnaire. Beta coefficients are reported from linear regression models;

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

^ This data has been reported previously in Mulraney et al., submitted.

The mean scores of all the measures were highest for the group with certain impairment of functioning due to irritability, follow by somewhat impaired, and not impaired (Table 2). The results of the ANOVA revealed significant differences for all of the measures except the SDQ prosocial behaviour subscale, although scores for this subscale were in the expected direction. Post hoc analyses revealed all of the differences between groups as significant with two exceptions those being: the difference between the groups somewhat and certainly impaired on CES-D was not significant but both of these groups had significantly higher mean scores than not impaired, and the difference between the groups somewhat and certainly impaired on the LSAS was not significant but again both groups had significantly higher mean scores than the not impaired group.

Table 2

Sample Characteristics Grouped by Self Report Impairing Irritability

	Impairing Irritability					
	Not True		**Somewhat True**		**Certainly True**	
	n = 248 (64.9%)		**n = 104 (27.2%)**		**n = 30 (7.9%)**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
ARI total	1.51	1.47	3.27	2.31	6.18	3.24
Cranky Thermometer	56.57	26.06	70.85	24.09	84.07	17.60
Youth Measures						
RADS-2	50.91	12.06	58.92	11.94	71.51	13.23
SDQ total	8.41	4.67	11.80	4.49	19.08	5.49
SDQ emotional	2.60	2.37	3.98	2.43	5.67	2.23
SDQ conduct	1.32	1.17	1.78	1.29	3.67	1.50
SDQ peer	1.11	1.26	1.82	1.22	3.25	2.14
SDQ hyper	3.40	2.03	4.23	2.13	6.50	2.07
SDQ prosocial	8.40	1.20	8.03	1.54	7.67	1.67
Adult Measures						
CES-D	11.42	9.50	20.13	10.83	26.00	10.50
GAD-7	4.05	4.10	7.78	4.68	11.00	6.20
LSAS	33.50	22.13	44.39	24.62	59.47	26.38

ARI, Affective Reactivity Index; RADS-2, Reynolds Adolescent Depression Scale-2; CES-D, Centre for Epidemiologic Studies Depression Scale; SDQ, Strengths and Difficulties Questionnaire; GAD-7, Generalized Anxiety Disorder Screen; LSAS, Liebowitz Social Anxiety Scale.

Discussion

This paper aimed to describe irritability in adolescents and adults and any difference in associations with psychopathology that irritability may have between these groups. Contrary to the popular belief, adults reported significantly higher levels of irritability than adolescents on the ARI. The parent report irritability ratings for adolescents were a similar level to adult self-report ratings of irritability. Additionally adult and adolescent self-report ratings of irritability on the Cranky Thermometer were similar.

There was no relationship between age and any of the measures of irritability. There were no differences in irritability for either age group, or for the whole sample, according to gender except that women might report slightly greater impairment of functioning due to irritability. The interaction between age group and gender approached significance indicating that adult men may report a lower level of impairment due to irritability than adolescents and adult women. This analysis suffered from a lack of power as the number of adult men in this sample was relatively small. It is possible that a larger sample size would clarify this point.

Differences between adults and adolescents were found when investigating the impairment item on the ARI. After the sample was grouped according to level of impairment it was found that the mean depression and anxiety scores of adults who certainly had impairment were above the clinical cut-off levels. Whereas the mean scores for adolescents with certain impairment due to irritability were below clinical cut-off on all the measures. This might indicate that adolescents are more prone to experiencing impairing irritability in the absence of categorical mental health problems than adults. Thus, while the level of reported irritability may not differ greatly between adults and adolescents, irritability is more of an impairment in the lives of adolescents. Longitudinal studies have consistently found that high levels of irritability during adolescence are predictive of the development of internalising disorders (Brotman et al., 2006; Leibenluft et al., 2006; Stringaris and Goodman, 2009a; Stringaris et

al., 2009). There was a strong positive association between level of irritability and impairment, thus it may be that those adolescents in the current study with impairing irritability will go on to develop internalising disorders in young adulthood.

In terms of the second aim, a regression model controlling for age and gender revealed that irritability, as measured by the Cranky Thermometer, was strongly associated with depressive symptoms in both adults and adolescents. In adults there was also a strong association between Cranky Thermometer ratings, generalised anxiety symptoms, and social anxiety symptoms. This is consistent with prior findings about the association between irritability (as measured by the ARI) and psychopathology (Mulraney et al., submitted). While for adolescents there were strong associations between the Cranky Thermometer ratings and all of the SDQ subscales with the exception of prosocial behaviour. Thus in this sample irritability is strongly associated with symptoms of mental illness but not with prosocial behaviours. This is in contrast to previous research using the ARI that found strong negative relationships between irritability and prosocial behaviour (Mulraney et al, submitted; Stringaris and Goodman, 2009b). The Cranky Thermometer measures peak irritability over the past two weeks, while the ARI measures average irritability over the past six months. Thus it may be that the level of irritability generally experienced by a person is related to their prosocial behaviour while peak irritability in a two week period is not.

These findings indicate that there is little difference in the association between irritability and depressive symptoms between adults and adolescents. This raises the question as to why in diagnostic classification systems irritability is considered a symptom of child and adolescent depressive disorders but not adult depressive disorders. Several papers have demonstrated a link between depression in adults and irritability (Craig et al., 2008; Pasquini et al., 2004; Perlis et al., 2009; Perlis et al., 2005). Irritability has been shown to be a salient feature of depressive disorders in children and adolescents (Crowe et al., 2006; Masi et al., 2001;

Stewart et al., 2002) despite its initial inclusion in DSM-IV depressive disorder not being based on empirical evidence (Kessler et al., 2001). However, there does not appear to be in the literature at this time any findings comparing irritability in depressive disorders between children, adolescents, and adults. While the current study only examines symptoms, the findings raise the issue that irritability may also be a relevant characteristic of adult depressive disorders and further work needs to be done to confirm this finding.

A strong association was found between irritability and generalised anxiety symptoms in adults which is to be expected given that irritability is a symptom of generalised anxiety (APA, 2013). Of interest is the finding of a strong association between irritability and social anxiety symptoms in adults. There has been little research in the area to indicate whether there is a relationship between irritability and social anxiety and there is no mention of irritability in the description of social anxiety disorder in DSM-5 (APA, 2013). However, there were moderate correlations in this sample between social anxiety symptoms, generalised anxiety symptoms ($r = 0.54$), and depressive symptoms ($r = 0.53$). Additionally social anxiety disorder has high rates of co-morbidity with other anxiety disorders and mood disorders (Grant et al., 2005; Schneier et al., 1992) for which irritability is a symptom which may explain the relationship found in the current study.

There are several limitations to this paper. The first is that this was a cross-sectional study which used samples that do not necessarily represent the general population in Australia. Further, the adult sample primarily comprised young adults (20-25 years). Therefore any conclusions that can be made from the findings relate to associations and comparisons between young adults and adolescents. In order to fully understand the developmental nature of irritability longitudinal data is needed. Secondly this sample is drawn from the general population and while it likely contains some participants with mental health problems any inferences about the relationship between irritability and psychiatric problems are tentative.

The research needs to be replicated with a clinical sample. Thirdly because the adults were assessed using on-line methods and the adolescents were assessed in school group settings, different measures were used to assess depressive symptoms in adults and adolescents. The measures used are similar and correlate well however, ideally the same measure should be used. Finally, only internalising disorders were assessed in adults. Research with adolescents has shown that irritability is associated cross-sectionally with both internalising and externalising disorder but longitudinally only with internalising disorders (Stringaris and Goodman, 2009a, 2009b). It would be interesting to determine if the cross-sectional association with externalising disorders also exists for adults. Although this may be difficult as there is no equivalent concept of externalising disorders in adults.

Contrary to the widely held belief, it may not be true that people are more irritable during adolescence than at any other stage of their life. However, adolescents who are otherwise mentally healthy experience impairment of functioning due to irritability. This study has provided the first direct comparison of associations of irritability and depressive symptoms between adolescents and adults. The findings suggest, that at least in young adults, irritability may continue to be a significant feature of depression and emotional (internalising) disorders.

Declaration of Conflicting Interests

The authors have declared that there is no conflict of interest.

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Chapter 6

Paper 3: Can irritability act as a marker of psychopathology?

This chapter addresses the idea of whether irritability can distinguish between diagnoses or whether it should be thought of as similar to a fever in that it is a marker for psychopathology but it is not specific to any particular disorder. The findings presented in this chapter address aims one, four, and five of the overall thesis. Aim one is addressed through the inclusion of a ROC analysis to determine if the ARI (and thus irritability) is a good predictor of psychopathology. The fourth aim is addressed through a comparison of the community and clinical samples level of irritability and level of impairment associated with irritability. The findings regarding the fifth aim extend upon the findings presented in Chapter 4. Chapter 4 presented the associations between irritability and internalising and externalising symptoms in a school sample. This chapter presents the associations that irritability has for a clinical sample with internalising and externalising symptoms.

Monash University

Declaration for Thesis Chapter Six

Declaration by candidate

In the case of Chapter Six, the nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Reviewed literature; designed study, secured ethics; collected, coded and statistically analysed data; prepared paper.	80%

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	**Nature of contribution**	**Extent of contribution (%) for student co-authors only**
Glenn Melvin	Co-investigator, participated in study design, and assisted with preparing and revising the paper.	
Bruce Tonge	Co-investigator, participated in study design, and assisted with preparing and revising the paper.	

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's Signature		**Date**

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Can irritability act as a marker of psychopathology?

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Abstract

Irritability is ubiquitous in child and adolescent psychopathology. This study aimed to determine if The Affective Reactivity Index (ARI), a measure of irritability, could be used to screen for psychopathology in adolescents. The clinical sample comprised thirty one adolescents with a DSM-IV diagnosis. The control sample was 31 gender and age matched adolescents recruited through schools. Both samples completed a test battery that included the Affective Reactivity Index. The clinical participants reported significantly higher levels of irritability and impairment of functioning due to irritability than the control sample by both self and parent report. The ROC analysis found a cut off value of 4 on the self report ARI to be optimal with a specificity of 77.4% and a sensitivity of 77.4%, the area under the curve was 0.86. This paper provides empirical evidence to support the idea that irritability in psychopathology in analogous to a fever in internal medicine.

KEYWORDS: irritability, adolescence, Affective Reactivity Index, psychopathology

Irritability has been defined as ‘easy annoyance and touchiness, [that] is characterised by the emotion of anger, and temper outbursts can be its behavioural manifestation’ (Stringaris, 2011, p. 61). Irritability is a symptom of a number of paediatric psychiatric disorders both internalising and externalising (APA, 2013). Cross-sectional studies have shown that irritability is associated with both internalising and externalising symptoms (Mulraney, Melvin, & Tonge, unpublished data; Stringaris & Goodman, 2009b; Stringaris et al., 2012). Longitudinal studies reveal that irritability during adolescence is predictive of suicide risk (Pickles et al., 2010) and the development of internalising disorders (Leibenluft, Cohen, Gorrindo, Brook, & Pine, 2006; Stringaris & Goodman, 2009a; Stringaris, Cohen, Pine, & Leibenluft, 2009) even after controlling for baseline psychopathology. It is a widely held belief that people are more irritable during adolescence than at any other stage of their lives (Buchanan, Eccles, & Becker, 1992). If this belief is accurate it may be that the high levels of irritability in adolescents with psychiatric disorders are partially a result of the developmental stage. Although research has found that those who have a diagnosis of a mood disorder report higher levels of irritability than healthy volunteers (Stringaris et al., 2012).

There is some evidence that, despite irritability being a feature of so many conditions, the type and severity of irritability and the level of impairment associated with it may be able to distinguish between diagnoses. Mick, Spencer, Wozniak, and Biederman (2005) investigated irritability in three diagnostic groups; a group with ADHD and comorbid bipolar disorder, a group with ADHD and comorbid depression, and a group with ADHD and no history of mood disorders. The researchers identified three types of irritability measured by a diagnostic interview (K-SADS); oppositional defiant disorder (ODD)-type irritability, depressive-type irritability, and manic-type irritability. All three groups experienced the milder ODD-type irritability, both of the mood disordered groups experienced the depressive-

type irritability which was more impairing than ODD-type, and only the group with comorbid bipolar disorder experienced the most impairing manic-type irritability.

Further support for this position comes from research investigating paediatric bipolar disorder. Leibenluft, Charney, Towbin, Bhangoo, and Pine (2003) proposed several phenotypes of paediatric bipolar disorder one of which, the broad phenotype, they labelled as severe mood dysregulation (SMD) to highlight their belief that it is distinct from bipolar disorder. SMD is characterised by the experience of severe, chronic irritability and hyperarousal symptoms. Since its conception there has been a body of research that has shown SMD differs from bipolar disorder in terms of family history (Brotman et al., 2007), level of impairment (Brotman et al., 2007; Dickstein et al., 2007; Dickstein et al., 2005) and several measures of neurological functioning (Dickstein et al., 2007; Rich et al., 2008) indicating that they are in fact distinct disorders. Stringaris et al. (2012) reported that the level of irritability could distinguish between four diagnostic groups, with the lowest irritability ratings for healthy volunteers, followed by those at familial risk for bipolar disorder, then those diagnosed with bipolar disorder, with those diagnosed with SMD reporting the highest levels.

While it is interesting to know that the type and severity of irritability may be able to distinguish between diagnoses one must ask what the utility of this is, particularly as DSM-5 includes irritability as a cross-cutting symptom in children and adolescents (APA, 2013). The inclusion of irritability as a cross-cutting symptom will allow clinicians a means by which to assess if a person is experiencing irritability, regardless of whether their diagnosis includes it as a symptom. This will provide clinicians with more scope to treat relevant symptoms, such as irritability, alongside their standard treatment for whatever condition the patient presents with. The analogy of a fever has been used to discuss irritability; that it is a sensitive indicator that there is something wrong but it is not specific to any particular disorder (Kowatch,

Youngstrom, Danielyan, & Findling, 2005; Stringaris, 2011). Perhaps it may be more useful in practical terms to view irritability in this manner, as a marker that the person is unwell and requires further assessment.

With the recent interest in irritability questions have been raised regarding the validity of tools that have been used to measure irritability in the past (Born & Steiner, 1999; Stringaris et al., 2012). To address some of these issues, particularly that there were no paper and pencil questionnaires designed to measure irritability in children or adolescents, Stringaris et al. (2012) created the Affective Reactivity Index (ARI). The ARI has been found to be a reliable and valid measure of irritability in children and adolescents in the US and UK (Stringaris et al., 2012). Brief measures have been found to be very useful as screens for psychopathology. The K6 for example, a six item screen that contains questions about anxiety and depressive symptoms, was found to be a better predictor of serious mental illness (not just depression and anxiety) in adults than the Composite International Diagnostic Interview Short Form (CIDI-SF) (Kessler et al., 2003). The K6, however, does not include any assessment of impairment of functioning. As irritability is ubiquitous in psychopathology it is plausible that an irritability measure, such as the ARI, could screen for psychological disorders.

This paper has several aims; firstly to determine if the level of irritability and level of impairment associated with irritability is different between normal and clinical samples. It is hypothesised that both the level of irritability and the level of impairment associated with irritability will be higher in the clinical sample than in the normal sample. The second aim of this paper is to investigate if the ARI can screen for psychological disorders and to determine an optimal cut-off value against DSM-IV diagnosis. The final aim is to investigate if there are differential associations between irritability and internalising and externalising symptoms. It

is hypothesised that there will be a stronger association between irritability and internalising symptoms than externalising symptoms.

Method

Participants

The clinical participants were 31 patients (22 female) aged 13 to 18 years (m = 15.29, SD = 1.32) recruited from an adolescent inpatient unit (n = 25), an outpatient unit (n = 3), and a private psychiatric practice (n = 3). Patients were invited to participate if they were considered well enough to complete the questionnaires by their treating clinician (i.e. had sufficient insight and reading and writing ability, and were not actively psychotic or intoxicated). The participants recruited through a private practice were assigned a diagnosis by an experienced child psychiatrist according to DSM-IV criteria. The participants recruited through the inpatient and outpatient units were assigned diagnoses by a multidisciplinary team including a psychologist and child psychiatrist according to DSM-IV criteria. The primary diagnoses of patients were; major depressive episode (n = 20), borderline personality disorder (n = 2), bipolar disorder (n = 1), oppositional defiant disorder (n = 2), adjustment disorder (n = 1), conduct disorder (n = 1), schizophrenia (n = 1), and Asperger's disorder (n = 2). Participants had a mean of 1.73 (SD = 0.14) diagnoses which included; borderline personality disorder (n = 2), schizotypal personality disorder (n = 1), anorexia nervosa (n = 1), dysthymia (n = 3), social anxiety disorder (n = 1), generalised anxiety disorder (n = 1), and attention deficit hyperactivity disorder (n = 2). In the clinical sample 10 parents chose not to complete parent report measures resulting in 21 complete dyads.

The 31 control participants were selected from a previously described sample of 164 adolescents (Mulraney et al., submitted) recruited from local secondary schools to match clinical participants on age and gender. The control sample had a mean age of 15.32 years

(SD = 1.33) and 22 were female. All parents in the control sample completed the parent report measures.

Materials

The Affective Reactivity Index (ARI) is a six item questionnaire that assesses irritability over the past six months. The scale also includes an item enquiring about the level of impairment associated with irritability (Stringaris et al., 2012). The scale is reliable (α = 0.88-0.92) and validity studies have found that scores on the scale discriminate between healthy volunteers, children with bipolar disorder, and children with severe mood dysregulation (Stringaris et al., 2012).

The Cranky Thermometer is a visual analogue scale that ask respondents to rate on a scale of 0-100, with 0 being not at all cranky/irritable/annoyed and 100 being very, very cranky/irritable/annoyed, their peak level of crankiness over the preceding two week period. The Cranky Thermometer has been found to have acceptable test-retest reliability (ICC = 0.64) and good validity, it is able to discriminate between individuals independently rated by a clinician as irritable, somewhat irritable, and not irritable (unpublished data).

The Stengths and Difficulties Questionnaire (SDQ) is a 25 item measure of psychological wellbeing. It contains five subscales two of which measure externalising problems (conduct problems and hyperactivity/inattention), and one of which measures internalising problems (emotional problems). The scale has consistently been found to have robust psychometric properties (Goodman, 2001; Goodman & Scott, 1999) including in Australian adolescents (Hawes & Dadds, 2004).

Procedure

The study was advertised to the clinical sample by their treating clinician. Once patients expressed interest in the study parental consent and young person assent was sought. After which the participants completed the questionnaires in the presence of one of the researchers. Parents completed the parent report questionnaires in their own time and posted them back to the researcher. Participants in the control sample were invited to participate through their school. Letters explaining the research and requesting parental consent were mailed directly to parents. Once parental consent had been obtained students completed the questionnaires in a group setting during school hours with one of the researchers present. The parent report questionnaires were completed over the phone. Both samples received identical information about the study.

Statistical Analysis

All analyses were conducted separately by reporting source (i.e. parent report versus self report). The temper tantrum item was removed from the SDQ conduct problems subscale for the analyses with ARI total score as it is identical to an item on the ARI. To address the first aim, mean scores were calculated for ARI total (parent and self report) and the Cranky Thermometer. Independent measures t-tests were conducted between the clinical sample and community sample. To test for group differences on the ARI impairment item a Chi Square test for independence was used. A t-test was also conducted to test for gender differences and Pearson's correlations explored any relationships between age and irritability.

To address the second aim a receiver operating characteristic (ROC) analysis was conducted (for both parent and self report) to determine the optimum ARI cut point to distinguish between those with and without a current diagnosis of a DSM-IV-TR disorder. Another ROC analysis was conducted to determine if the impairment item on the ARI could be used to distinguish between those with and without a current diagnosis of a DSM-IV-TR disorder.

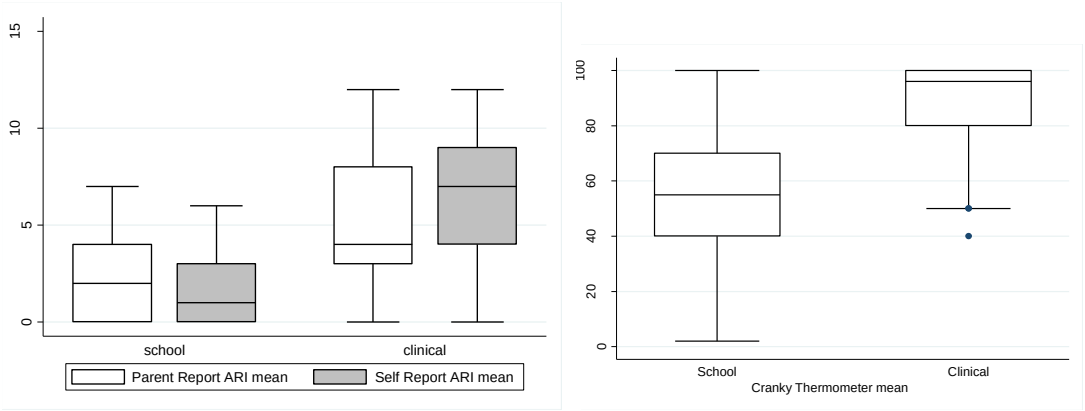
To address the third aim ARI total was regressed on the SDQ internalising (emotional problems) and externalising (conduct problems and hyperactivity) subscales, this was repeated for the ARI impairment item and the Cranky Thermometer.

Results

The mean ARI total score by parent report was significantly higher (t (50) = -3.89, p <0.001) for the clinical group (M = 5.35, SD = 3.76) than for the control group (M = 2.26, SD = 2.11). By self report the mean ARI total score was also significantly higher (t (60) = -6.25, p <0.001) for the clinical group (M = 6.23, SD = 3.53) than for the control group (M = 1.90, SD = 1.80). The mean Cranky Thermometer score was significantly higher (t (60) = -6.26, p <0.001) in the clinical sample (M = 87.10, SD = 18.42) than in the control group (M = 53.39, SD = 23.65). The mean scores (and 95% CI) for ARI total and Cranky Thermometer by group are shown in Figure 1. A significantly greater percentage of clinical participants than controls also indicated that their irritability causes them problems; by both parent (χ^2 (2, N = 52) = 18.67, $p < 0.01$) and self report (χ^2 (2, N = 62) = 32.57, $p < 0.01$). There was no difference on any of the irritability measures according to gender and Pearson's correlations revealed no relationship between age and irritability.

Figure 1

Mean (and 95% CI) self- and parent report ARI and Cranky Thermometer scores by group.



A ROC analysis was conducted to determine the optimum cut-off value on the ARI to distinguish participants with and without a DSM-IV diagnosis. For self report the area under the ROC curve was 0.86 (95% CI 0.76 to 0.95). The optimum cut off point was 4 which had a sensitivity of 77.4% and a specificity of 77.4%. For parent report the area under the ROC curve was 0.76 (95% CI 0.62 to 0.89). The optimum cut off point was 3 which had a sensitivity of 76.2% and a specificity of 64.5%. However, further investigation revealed that the problem item on the ARI was actually a better classifier than the ARI total score with an area under the ROC curve of 0.88 (95% CI 0.80 to 0.96) for self report, the two curves can be seen in Figure 2. For a response of somewhat true or higher the sensitivity was 90.32% and the specificity was 80.65%. For parent report the impairment item was also a better classifier than the ARI total with an area under the ROC curve of 0.82 (95% CI 0.71 to 0.93), the two curves can be seen in Figure 3. For a response of somewhat true or higher the sensitivity was 85.71% and the specificity was 67.74%.

Figure 2

Receiver operating characteristic curve for the Affective Reactivity Index (self report) against a DSM-IV diagnosis

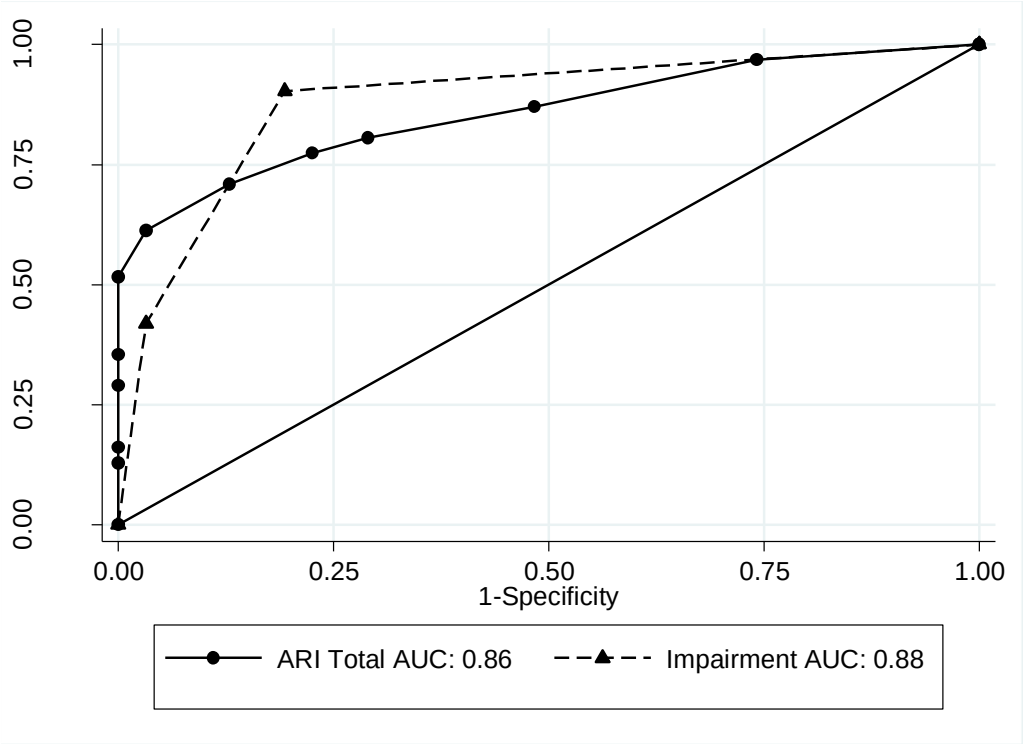
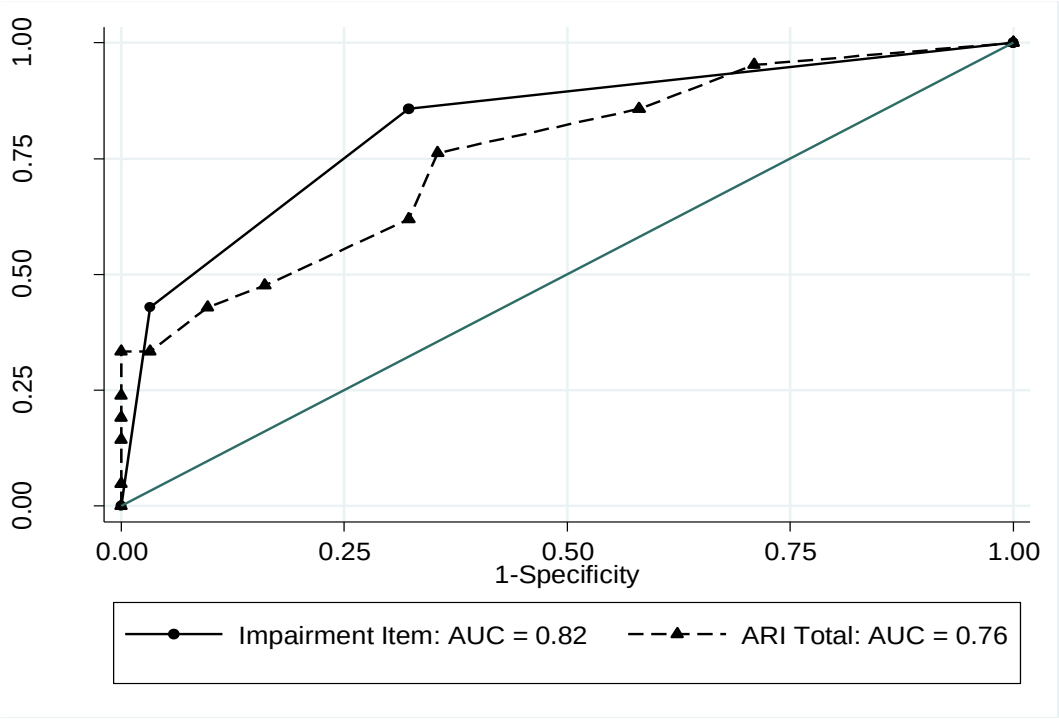


Figure 3

Receiver operating characteristic curve for the Affective Reactivity Index (parent report) against a DSM-IV diagnosis



Within the clinical group Pearson's correlations revealed relationships between irritability and internalising and externalising symptoms as measured by the SDQ (Table 1). Regression analyses revealed that irritability was a strong predictor of conduct problems but only ARI total predicted emotional problems and hyperactivity (Table 2).

Table 1

Pearson's Correlations between Self Report Irritability and the SDQ Subscales for the Clinical Sample

	SDQ				
	Emotional	**Conduct**	**Hyperactivity**	**Peer**	**Prosocial**
ARI total	0.39*	0.54**	0.50**	0.28	-0.22
ARI Problem Item	0.16	0.63**	0.32	0.36*	-0.22
Cranky Thermometer	0.31	0.36*	0.07	0.21	0.06

ARI, Affective Reactivity Index; SDQ, Strengths and Difficulties Questionnaire

**$p < 0.01$, *$p < 0.05$

Table 2

Beta coefficients between self report irritability and emotional and conduct problems subscales of the SDQ for the clinical sample

	SDQ		
	Emotional	**Conduct**	**Hyperactivity**
ARI Total	0.39*	0.54**	0.50**
ARI Problem Item	0.16	0.63***	0.32
Cranky Thermometer	0.31	0.41*	0.07

ARI, Affective Reactivity Index; SDQ, Strengths and Difficulties Questionnaire.

Beta coefficients (and 95% confidence intervals) are reported from linear regression models;

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

Note the SDQ hyperactivity/inattention subscale was not included as none of the regressions were significant.

Discussion

This paper aimed to examine differences in irritability and impairment associated with irritability between a community sample and a psychiatric sample of adolescents as well as to investigate the relationship irritability has with psychopathology. The first hypothesis was supported as the clinical group scored significantly higher on all measures of irritability and indicated a significantly greater level of impairment due to irritability than the community sample. This was to be expected as irritability is included as a symptom of a number of psychiatric conditions. Particularly given the composition of this group; only 2 participants had diagnoses that do not have irritability as either a symptom or an associated feature. As such one would expect there to be a higher level of irritability and for that irritability to be associated with greater impairment.

The paper also aimed to determine if irritability, as measured by the ARI, could be used as a marker of overall psychopathology. The ROC analysis indicates that the self report ARI can be used as a screen for psychopathology in adolescents; it had acceptable sensitivity and specificity against any DSM-IV diagnosis. However, the majority of participants in this sample had a diagnosis that includes irritability as a symptom which may limit the generalisability of this study. The parent report ARI however was not as good at correctly classifying participants. Ten of the clinical participants were missing parent report ARI data so it could be that with a larger sample size the parent report ARI will prove to be as useful as self report.

The third aim was to examine the differential associations between irritability and internalising and externalising symptoms in a clinical sample. The hypothesis was not supported as with this sample the association between irritability and externalising symptoms was stronger than the association between irritability and internalising symptoms. This builds upon the previous findings with the community sample where a slightly higher level of

association was found between externalising symptoms and irritability than internalising symptoms and irritability (Mulraney et al., submitted). This finding however, contrasts with previous work that has found a stronger association between irritability and internalising symptoms. It may be that the discrepancy between the current findings reflects actual differences in the samples. Prior research investigating this area has been conducted with youth from the US and UK (Stringaris et al., 2012). The sample in the current study was small so the findings need to be replicated.

The results presented here lend support to the idea that irritability is a non-specific symptom of mental illness. The DSM-5 field trials included irritability as a cross-cutting symptom and using the ARI demonstrated it to be a reliable assessment (Narrow et al., 2013). The findings of this study are supportive of this decision and demonstrate that irritability can be used as an indicator of psychopathology. The results from the ROC analysis show that both the level of irritability and the level of impairment associated with irritability can be used to screen for general psychopathology, though impairment is a better classifier. Thus clinicians who are completing an assessment that includes the cross-cutting symptoms may find it more helpful to ascertain if irritability causes the person problems than simply determining the level of irritability a person is experiencing. Thus the ARI may have an advantage over other brief screening measures, such as the K6, which do not assess impairment of function. Although Wakefield, Schmitz, Baer (2010) found that the impairment specifier for a diagnosis of major depressive disorder is redundant and that in fact if only impairment was used there would be a very high number of false positives. Future research could clarify whether ARI total, the impairment item, or both are the ideal for screening for psychopathology.

Though this paper presents valuable data it does have several limitations, the first being sample size. As there were only 31 clinical participants, the majority of who were diagnosed with a depressive disorder, comparisons between diagnostic groups were not possible and the

findings may not be generalisable. Additionally ten parents in the clinical sample chose not to complete parent report measures limiting the power of the analyses using parent report variables. Small sample sizes limit the statistical power of any analysis (Tabachnik & Fidell, 2007), although given that significant results were found with such a small sample size the effects reported here are quite large. Another limitation is that the community sample were not administered a diagnostic interview so it is possible that some of them had undiagnosed psychiatric conditions. However the participants completed the SDQ and the Reynolds Adolescent Depression Scale-2, a screen for depression, and none of the community sample participants scored above cut off on these measures. There may have been a self-selection bias as it was made clear to potential participants that the study was investigating irritability. However, as both groups received the same information any self-selection bias would be present in the clinical and community groups.

Future research should be conducted with larger sample sizes. If a similar cut off value was found using a ROC analysis on such a sample it would strengthen the argument that the ARI can be used as a screen for general psychopathology. It has been postulated that irritability is to psychopathology as a fever is to infection (Kowatch, et al., 2005; Stringaris, 2011), this paper has provided empirical evidence that supports this position.

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Chapter 7

General discussion

The main aim of this chapter was to integrate the three papers and discuss how each of the major thesis aims were addressed. This chapter contextualises the findings in theory and prior research and also discusses how the findings relate to DSM-5. Methodological strengths and limitations are discussed and potential avenues of further research are suggested. The chapter concludes the thesis with a discussion of the implications of the findings.

General discussion

7.1 Psychometric properties of the Affective Reactivity Index

The first aim of the thesis was to report the preliminary psychometric properties of the ARI on an Australian sample of adolescents and, for the first time, with adults. The results presented in Chapters 4 and 6 address this aim. Consistent with Stringaris et al. (2012) the ARI was found to be reliable in the adolescent sample and the validity data was also promising. The findings of this thesis are also in line with the work of Stringaris et al. (2012) in regards to the factor analysis, though the interpretation of results differs. Stringaris et al. (2012) proposed a six item single factor structure for the ARI and using confirmatory factor analysis the data was a good fit for the proposed model for the parent report version. Stringaris et al. (2012) argue that the data was also a good fit for the six item single factor structure for the self report version, though the authors acknowledged that the root mean square error of approximation (RMSEA) was higher than the recommended benchmark of 0.06. In one of their samples the RMSEA was only slightly above the benchmark, but in the other it was well out of the acceptable range indicating that a six item single factor structure was not an ideal fit for the data. The results presented in Chapter 4 are consistent with this. The parent report six item single factor structure was found to be an adequate fit for the data but this was not suitable for the self report format of the scale. There was a high level of covariance between the items ‘often loses temper’ and ‘loses temper easily’ on the self report version for both adults and adolescents. Removing the item ‘loses temper easily’ made the data fit the model very well for adults, whereas removing the item ‘often loses temper’ resulted in the best fit for adolescents. Thus there is a small level of item redundancy in the self report version of the scale. It is likely the findings presented in Chapter 4 are more robust than those presented by Stringaris et al. (2012) as for the adolescent self report format in this

study there were 396 participants, while Stringaris et al. (2012) had sample sizes of 214 and 88.

The ROC analysis presented in Chapter 4 extends upon the findings of Stringaris et al. (2012) who found that total ARI scores were significantly different between diagnostic groups, in the expected directions. The ROC analysis showed that, for the self report version at least, a cut off score of 4 could be used on the ARI to distinguish between those with and those without a DSM-IV diagnosis with acceptable sensitivity and specificity. Additionally, a response of somewhat true or certainly true to the impairment item was a good discriminator between those with and those without a DSM-IV diagnosis. The recent field trials for DSM-5 included irritability as a cross-cutting symptom for children and adolescents (Narrow et al., 2013). The trials used a two stage process to assess each symptom. If a child or adolescent, or their parent, indicated at the first step that they had been irritated or easily annoyed for at least several days in the past two weeks they were administered the second step assessment. The ARI, with a modification changing the time frame from the past six months to the previous week, was used to assess irritability at the second stage. The reliability reported for irritability in the field trials was good (Narrow et al., 2013). This finding and the fact that the task force working on DSM-5 chose to use the ARI to measure this symptom demonstrates expert confidence in the measure and its psychometric properties.

7.2 Irritability in adolescents versus adults

The second aim of the thesis was to compare the level of irritability and the level of impairment associated with irritability between adults and adolescents. This was an important aim to address as there has been very little research regarding how irritability differs across the lifespan though, as discussed at length in Chapter 2, it is an important psychiatric symptom. An extensive search of the available literature revealed only four studies that mentioned how irritability differed across the lifespan and two of those were in the context of

depression or bipolar disorder. Of the two remaining papers one reported how irritability developed across adolescence (Leibenluft et al., 2006) and the other reported how the level of reported irritability changed from when it was first assessed during childhood or adolescence to when it was reassessed at an 18 year follow up (Fichter et al., 2009). Both of these studies were longitudinal in nature and as such have provided some valuable insight into the development of irritability. The findings of these studies are generally consistent with the widely held view that people are more irritable during adolescence than at other stages of their lives (Buchanan et al., 1992), though there is no data provided about how irritability changes from childhood into adolescence or throughout adulthood. These papers also only present information about the level of irritability people reported experiencing, no information regarding impairment of functioning due to irritability was reported. The results presented in Chapter 5 regarding the level of irritability in adults and adolescents differ from the findings of Fichter et al. (2009) and Leibenluft et al. (2006). According to one of the measures of irritability, the Cranky Thermometer, there was no difference between adults and adolescents on level of reported irritability. Whereas responses to the ARI by adults showed higher levels of irritability compared to adolescents. There are several possible reasons as to why these results differ from those reported previously, firstly the current findings are cross-sectional so the difference may be due to between group differences rather than age related differences. Secondly this study uses questionnaires to measure differences while the previous literature has used information gathered in diagnostic interviews. It is not known how well the ARI correlates with irritability assessed through diagnostic interview; as such it is possible that slightly different aspects of irritability are being measured. Of interest was the interaction between age and gender effects on impairing irritability. There was a trend toward women reporting slightly greater impairment of functioning due to irritability. This may be due to adult men reporting a lower level of impairing irritability, which approached

significance, than adult women and male and female adolescents. However this result may be influenced by the low number of older adults and particularly older men (n = 4 over 34 years) in the sample. Women experience higher rates of depressive disorders than men (Kessler, 2000, 2003) and the data in this sample shows that, particularly in adults, impairing irritability is associated with depressive symptoms.

Another possible explanation why women may report greater impairment of functioning due to irritability could be gender differences in emotion regulation strategies. Women engage in much more rumination than men (Garnefski & Kraaij, 2006). Leigh et al. (2012) discuss how rumination maintains an irritable mood and can worsen it; high levels of rumination have also been linked to increased depressive symptoms (Garnefski & Kraaij, 2006). Thus impairing irritability may have different developmental trajectories for men and women though longitudinal data with larger sample sizes is needed to determine if this is the case.

7.3 Age differences in the relationship between irritability and psychopathology

The third aim is closely related to the second aim and that was to compare the associations that irritability and impairing irritability has with psychopathology between adults and adolescents. Again this is an important area of study particularly in regards to the relationship irritability has with depression. According to the DSM-5 in childhood and adolescence irritability is a symptom of depressive disorders, it is considered so important that it can actually replace sad mood as the primary symptom. Yet it is not mentioned in the DSM-5 description of adult depressive disorders at all, as a symptom or an associated feature. It is a little counterintuitive that once a person turns 18 years of age what had been a symptom of their depressive illness now ceases to have any diagnostic value whatsoever. The literature search outlined in Chapter 5 could not find any published studies that compare the prevalence of irritability in depression between adolescents and adults. There is indirect

evidence that suggest a negative relationship between age and irritability in depression. Borchardt and Meller (1996) conducted a chart review of child and adolescent inpatients with depression, they found that a significant number of both children and adolescents experienced irritability though it was more common in children. Among adults with major depressive disorder irritability was found to be more common in those who were younger (Perlis et al., 2005). The findings presented in Chapter 5 are a direct comparison of the association that irritability has with depressive symptoms between adults and adolescents. Due to the inclusion of irritability in DSM-5 depressive disorders for adolescents but not for adults, as well as research that has found irritability to be present in 46% of adults with MDD (Perlis et al., 2005) and over 80% of children and adolescents with depressive disorders (Crowe et al., 2006; Masi et al., 2001; Stewart el al., 2002), it was expected that there would be an association between irritability and depressive symptoms in both adults and adolescents but that the association would be stronger for adolescents. The results partially supported this hypothesis, in that there was an association between irritability and depressive symptoms for both adults and adolescents. There was however, no difference in these associations with a very strong association for both adolescents and adults. Caution must be taken when interpreting the results as different instruments were used to measure depressive symptoms in adolescents and adults and again there is the issue that this is cross-sectional data. However, these findings provide an important step and suggest that irritability may continue to be of importance in depressive disorders at least into young adulthood. Ideas for how future research can further investigate this are presented in section 7.7. DSM-5 includes irritability as a cross-cutting symptom (APA, 2013) which may provide important extra information to clinicians assessing an adult patient with a depressive disorder until such time as the role of irritability in depressive disorders can be conclusively determined. Although it is worthwhile noting that DSM-5 doesn't really highlight the cross-cutting concept.

In terms of the relationship that impairing irritability has with psychopathology some very interesting differences were revealed between adults and adolescents. Table 2 presented in Chapter 5 has the mean scores on each of the measures of psychopathology grouped according to response to the impairment item on the ARI. The mean depression and anxiety scores of adults who indicated they had certain impairment of functioning due to irritability were all above the clinical cut off. This indicates that when adults experience impairing irritability it is likely to be in the context of depression and/or anxiety symptoms. A result that further strengthens the argument that irritability may be an important symptom to adult depressive disorders is that both the 'somewhat true' and 'certainly true' groups had mean scores well above the clinical cut off level on the CES-D. Thus adults in this sample who reported any sort of impairment of functioning due to irritability were likely to also report high levels of depressive symptoms. In contrast, for adolescents the mean scores were not above the clinical cut off for any of the measures of psychopathology. This indicates that adolescents are more prone to experiencing impairing irritability in the absence of mental health problems than adults. This may well be the source of the common belief that adolescents are more irritable than adults. While the level of reported irritability may increase from adolescence to young adulthood irritability causes more problems in the lives of adolescents.

Emotion regulation skills improve and become more adaptive as people age (John & Gross, 2004) and adolescents are less likely to use cognitive emotion regulation strategies than adults (Garnefski & Kraaij, 2006). The relationships between emotion regulation style and depressive symptoms are consistent from adolescence through to adulthood. However, the use of more adaptive emotion regulation styles, such as positive reappraisal, increase from adolescence to adulthood (Blanchard-Fields & Coats, 2008). Blanchard-Fields and Coats (2008) discuss how young people have not fully developed their emotion regulation

skills nor do they have the advantage of a wealth of prior experiences to guide their selection of the most appropriate style for any given situation. As such emotions may have a greater impact upon the lives of adolescents than adults. It could be that mentally healthy adults have had the time and experience to learn and develop more adaptive emotion regulation skills and thus are more adept at preventing their emotions, such as irritability, from being manifested in a manner which would impact upon their lives.

Aside from depressive symptoms other aspects of psychopathology were assessed for adults and adolescents. As such the remainder of this section will not be comparing the two age groups but simply commenting on the associations within each age group. For the adolescent sample the associations between measures of irritability and each of the subscales of the SDQ are reported in Chapter 4. Significant moderate correlations were found for the ARI with the emotional problems, conduct problems, and hyperactivity/inattention subscales (both parent and self report) which is consistent with past research that has found irritability to be associated cross-sectionally with both internalising and externalising problems (Stringaris et al., 2012). Of interest was that the correlations between irritability and prosocial behaviour differed according to reporting source as did the correlation between irritability and peer relationship problems. According to parent report there was no relationship between peer relationship problems and irritability but according to self report there were weak to moderate correlations the ARI with peer relationship problems. It is likely that this difference simply reflects the fact that parents are not witness to all of their child's interactions with peers and generally can only comment upon what is happening in the home. This may also be the explanation for the difference in relationship of prosocial behaviour and irritability according to reporting source. According to parent report there was a significant negative relationship between prosocial behaviour and irritability but according to self report there was no relationship between these variables. The cross-informant regression analyses revealed

that parent reported irritability was predictive of self reported emotional and conduct problems. While self reported irritability was predictive of only parent reported emotional problems. These cross-informant associations across internalising and externalising symptoms support the idea that irritability is a non-specific indicator of psychopathology.

For adults strong associations were found between irritability measures and measures of both generalised anxiety symptoms and social anxiety symptoms. There is a paucity of research investigating the relationship between irritability and anxiety. However irritability is included as a symptom of generalised anxiety disorder in DSM-5 and research has found that irritability during adolescence predicts GAD later in life (Leibenluft et al., 2006; Stringaris & Goodman, 2009a; Stringaris, Cohen, Pine, & Leibenluft, 2009) thus it was expected that there would be a relationship between irritability and GAD symptoms. The findings regarding the relationship between irritability and social anxiety symptoms were unexpected. Irritability is not listed as a symptom or associated feature of social anxiety disorder in the DSM-5 or ICD-10. A review of the literature could not identify any research that examines the relationship between irritability and social anxiety. It is possible that these findings reflect the actual situation, that irritability is related to all types of anxiety including social anxiety. If these findings were replicated it would again add strength to the move of DSM-5 to include irritability as a cross-cutting symptom as it may have relevance to people who have conditions that do not necessarily include irritability as a symptom. Another explanation for this finding is that there was a moderately strong correlation between social anxiety symptoms, generalised anxiety symptoms, and depressive symptoms, which could partially explain the relationship between irritability and social anxiety symptoms. Additionally social anxiety disorder tends to have high rates of co-morbidity with other disorders for which irritability is a symptom (e.g. GAD, mood disorders) (Grant et al., 2005; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). Thus it may be that these relationships account for

the association between irritability and social anxiety found in the current study though future research could clarify this.

7.4 Irritability in a psychiatric versus a community sample

The fourth aim was to determine if the level of irritability and impairment associated with irritability differed between a psychiatrically unwell sample and a community sample. As expected the clinical sample had significantly higher levels of irritability and impairment associated with irritability than the community sample. As discussed at length in this thesis, irritability is a symptom of a number of psychiatric conditions. Given the composition of this particular clinical sample included only two participants with diagnoses that did not include irritability as a symptom it is not surprising that they had such high irritability scores. Only one other study has compared the level of irritability between a psychiatric sample and a community sample (Stringaris et al., 2012) and the findings presented in Chapter 6 are consistent with their report of higher irritability in the psychiatric sample than in the healthy volunteers.

7.5 The relationship between irritability and internalising and externalising symptoms

The final aim of the thesis was to investigate if irritability has differential associations with internalising and externalising symptoms. The findings presented in all three papers address this aim. In Chapter 4 it is shown that in the community sample of adolescents there are moderate correlations between irritability and both internalising and externalising symptoms as measured by the SDQ. When a regression model was estimated using the ARI there were associations between irritability and both internalising and externalising symptoms however the association was stronger with externalising symptoms. This is consistent with prior findings from a UK sample where, according to self report, there were stronger associations between irritability and externalising symptoms than between irritability and

internalising symptoms. But it differs from parent report, where a stronger association between irritability and internalising problems was found (Stringaris et al., 2012). It is possible that these disparate findings reflect actual differences between Australian adolescents and those from the UK. When a regression model was estimated in Chapter 5 to determine the association between irritability as measured by the Cranky Thermometer the associations with internalising and externalising symptoms were very similar. This difference in the associations found using the Cranky Thermometer and the ARI may be due to these measures assessing different aspects of irritability over different time frames.

In the regression model estimated by Stringaris et al. (2012) both the healthy volunteers and the psychiatric sample were combined. The regression model presented in Chapter 6 differs from this presenting data from the clinical sample only. The associations found between irritability and externalising symptoms were much stronger than the associations between irritability and internalising symptoms. This is consistent with Stringaris et al.'s (2012) findings from self report data. Parent report data was not available for the clinical sample so it is not known whether parent report information in this sampled would reflect the findings of Stringaris et al. (2012) or be consistent with the data from the community sample. It is possible that the discrepancy between the work of Stringaris et al. (2012) and the results reported in Chapter 4 are due to Stringaris et al. (2012) combining the data from clinical participants and healthy volunteers for their regression model and the data in Chapter 4 pertaining to the community sample only. Healthy adolescents and adolescents with psychiatric illnesses may have different associations between irritability and other psychopathology. Combining these samples for analysis may obscure important differences. It is still not clear from the findings presented in this thesis whether there are differences in the cross-sectional associations between irritability and internalising and externalising symptoms in adolescents. It appears that irritability may be more strongly related to

externalising symptoms than internalising. There is also however an association between irritability and internalising symptoms and research has shown that irritability during adolescence is predictive of internalising disorders later in life (Brotman et al., 2006; Leibenluft et al., 2006; Stringaris & Goodman, 2009a; Stringaris et al., 2009). Little is known about the cross-sectional associations of irritability during adulthood. The results presented in Chapter 4 and 5 show that irritability in adults, measured by both the Cranky Thermometer and the ARI, is strongly associated with anxiety and depressive symptoms. It is not known if there are cross-sectional associations between irritability and externalising symptoms in adults. While there is no neat equivalent of externalising disorders in adulthood it would be interesting to examine any associations irritability has with antisocial personality disorder and adult ADHD which might act as adult equivalents of externalising problems.

7.6 Limitations

While the research presented in this thesis has its strengths and has contributed important information to advance knowledge in the area of irritability it is not without weaknesses. The majority of the limitations are in regards to sample composition and thus limit the generalisability and inferences that can be made about the results. While the school sample was drawn from a range of public and private schools in metropolitan and regional areas the response rate from students at those schools was quite low. Thus it cannot be assumed that it is a representative sample of adolescents in Southeast Australia. The adult sample was recruited from poster advertisements at a university and through online advertising. As such it is also not representative of the general population; the sample is skewed toward young adults receiving tertiary education. Adults without access to the internet who are not affiliated with the university did not have the opportunity to participate. In 2008-09, 74% of Australians over the age of 15 had internet access (Australian Bureau of Statistics [ABS] 2011) and while it is likely this number has increased over the past 3 years

there is still a substantial portion of the Australian population who do not have internet access and thus would not be able to participate in this research. As the sample is quite strongly skewed toward young adults it is possible that any findings reported in this thesis are applicable to young adults only. There may be different findings for those in middle and late adulthood. The clinical sample was quite small and thus any relationships found must be regarded as preliminary indicators only. The clinical sample was quite difficult to recruit. As the majority of participants were recruited through an inpatient service there was a large portion of patients who were not eligible for the study as they were too unwell (actively psychotic or violent). A large number of parents of eligible patients declined the invitation for their child to participate in the study. Of those who did participate only two thirds of parents in the clinical sample completed parent report measures so conclusions drawn regarding the parent report data are tentative at best. That said any relationships found to be significant with such small sample sizes are likely to be robust effects and should not be dismissed lightly.

Another limitation is that the same measures were not used to assess depressive symptoms in adolescents and adults. The use of the same measure would allow for more direct comparisons between the groups. However, as the adults were assessed using on-line methods and the adolescents were assessed in school group settings, different measures were used to assess depressive symptoms in adults and adolescents. The RADS-2 was chosen as the most appropriate psychometrically robust measure of adolescent depressive symptoms in the general population. The CES-D was chosen as out of the available psychometrically robust measures of depressive symptoms in adults it is the most like the RADS-2. These questionnaires are similar as they are both designed to measure depressive symptomatology in the general population, and have been shown to correlate well (Reinecke & Schultz, 1995). It would have been ideal to also measure anxiety symptoms in adolescents so that comparisons of the relationship between irritability and anxiety symptoms could be made

between adults and adolescents. This would have allowed for some discussion about the developmental trajectory of irritability in the context of anxiety in the same manner as there has been about irritability and depression. When measures were being selected for the adult sample an adequate equivalent to the SDQ could not be found, and the SDQ itself is not appropriate for use with adults given that a number of questions involve school. Only internalising symptoms were measured in the adult sample. Irritability has consistently been shown to predict internalising disorders during adulthood and but not externalising problems (Brotman et al., 2006; Stringaris & Goodman, 2009; Stringaris et al., 2009). However, it is not known whether the cross-sectional relationship that exists between irritability and externalising symptoms during adolescence continues into adulthood. Though as mentioned in section 7.5 there is no neat equivalent of externalising disorders in adulthood.

The study was cross-sectional and thus while some initial inferences can be drawn regarding the development of irritability to confirm these findings longitudinal data is needed. Any conclusions made about the relationships between irritability and psychopathology are tentative as none of the community sample completed structured diagnostic interviews. While it is expected that in any community sample a proportion of participants will have a mental health problem screening questionnaires only were used in the current study which are not diagnostic. A portion of participants from the community samples scored above the clinical cut off for these screens indicating they are likely to be suffering from some sort of mental health issues, thus the sample is representative of the general population in that regard. In Chapter 6 where comparisons are made between the community sample and the clinical sample it is more of an issue that the community sample were not assessed for psychiatric conditions, particularly in regards to the ROC analysis. The ROC analysis was testing the ability of the ARI to correctly classify participants as those with and those without a DSM-IV condition. Thus the uncertainty about whether any participants in

the community sample actually had an undiagnosed condition introduces error into the model, though this would increase the chances of a Type II error and thus makes the test more conservative. Steps were taken to limit the likelihood of this occurrence. In Chapter 6 only a sub-sample of participants were selected for comparison with the clinical sample. These participants were matched as closely as possible on age and gender, and care was taken to ensure that none of the community participants had scored above clinical cut off on any of the measures. These measures are designed to be sensitive and as such while it is possible it is unlikely that any of the control participants in Chapter 6 were suffering from a psychiatric condition.

7.7 Future directions

The current research has begun to answer some important questions about irritability. However, as discussed in the previous section there are some methodological limitations that need to be overcome in order to more fully answer the questions that were proposed in this thesis. There were also some gaps in the literature identified that were beyond the scope of the current thesis. Additionally the findings of the current research have raised more questions. This section will outline several suggestions for future research that could contribute valuable knowledge to the area of irritability and mental health.

First and foremost the review of the literature and the research completed in this thesis has highlighted that there is very little knowledge about the development of irritability. In recent years a considerable amount of research has been dedicated to investigating how emotion regulation skills develop. There is now strong evidence about the developmental trajectory of emotion regulation skills and the relationship between emotion regulation and psychopathology (e.g. Blanchard-Fields & Coats, 2008; Garnefski & Kraaij, 2006; McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011). Similar to emotion regulation, irritability has been implicated as a predictor of future psychopathology as such

research should explore the developmental trajectory of irritability more thoroughly; this would involve longitudinal studies that include all age groups from early childhood through to late adulthood. In any research of this nature it would also be advantageous to administer structured clinical interviews to confidently ascertain who has psychiatric conditions and who does not. This would allow for the clarification of many of the tentative inferences that have been drawn from the current study and also for further knowledge to be gained about the relationship between irritability and psychopathology.

While the initial psychometric investigations presented here and by Stringaris et al. (2012) regarding the ARI are very promising, further evaluation needs to be done. Comparisons with interview ratings of irritability need to be completed. The measure needs to have more test-retest data collected and extensive validation work needs to be undertaken with adults. It would be useful to determine if the ARI is sensitive to change as this would make it a tool of great value for clinicians who are treating people for irritability or other conditions for which irritability is a symptom and of value in clinical treatment trials. Particularly as it has been shown that while other symptoms may resolve under normal treatment irritability can continue to be an issue for patients (Tao et al., 2010; Yang et al., 2011). Given that irritability may not improve under treatment as usual (Torres et al., 2011; Volonteri et al., 2010) and can have a devastating impact upon a person's life (Yang et al., 2011), along with the inclusion of DMDD and irritability as a cross-cutting symptom in DSM-5 it is vital that there are efficacious, evidence-based methods to treat this symptom. It must also be noted that the version of the ARI endorsed in the DSM-5 has changed the duration from the previous six months to the previous week. Research needs to be conducted to determine how this change affects the psychometric properties of the measure. As there is currently no gold standard measure of irritability it is imperative that this research is conducted to determine if the ARI can fulfil that role.

As discussed in Chapter 2, very little research has been conducted into the treatment of irritability. Currently the only evidence based treatment for irritability is atypical anti-psychotics, and these only have evidence for their use in reducing so-called irritability in those with an autism spectrum disorder (Elbe & Lalani, 2012). It is imperative that more research is conducted into the treatment of irritability in populations other than those with an autism spectrum disorder and evaluations of the impact of current treatments on irritability are conducted so that clinicians have evidence based treatment strategies at hand to treat people who present with extreme, impairing irritability. This is particularly important given the inclusion of DMDD in DSM-5.

The research conducted in this study did not have a large enough sample sizes to fully address the idea that irritability may be able to discriminate between diagnoses. There is some limited evidence that the level of irritability and how impairing the irritability is can distinguish between diagnoses (Mick, Spencer, Wozniak, & Biederman, 2005; Stringaris et al., 2012), though others argue that irritability should not be used diagnostically as it is present in so many conditions (Kowatch, Youngstrom, Danielyan, & Findling, 2005; Stringaris, 2011). The inclusion of irritability as a cross-cutting symptom in DSM-5 may prove to be a great aid in determining the role of irritability in psychopathology. This approach allows irritability to remain as a symptom in those disorders for which it is highly relevant, such as bipolar disorder, but it can also be acknowledged as an area of concern for those patients who have a diagnosis that does not include irritability as a symptom. Having a standard assessment for irritability in DSM-5 (should it prove to be a psychometrically sound instrument) will overcome many of the issues discussed in Chapter 2 in relation to the conceptualisation of irritability. Narrow et al. (2013) discuss how the inclusion of cross-cutting symptoms will allow clinical research to flourish without the restriction of diagnostic

boundaries and that ultimately that research may lead to new conceptualisations of mental disorders.

7.8 Implications

The findings presented in this thesis suggest that perhaps impairment due to irritability is of greater significance to mental health than simple level of reported irritability, though there is a close relationship between the two. The ROC analysis presented in Chapter 6 indicates that the impairment item alone is a very sensitive indicator of psychopathology. This is preliminary evidence that needs to be replicated with larger samples. It does intuitively make sense that if a person's irritability is causing problems in their life they may be suffering from other mental health problems, or at the very least would benefit from some sort of intervention. As such, clinicians who are assessing a patient for the cross-cutting symptom of irritability should pay attention to the response to the impairment item. Although Wakefield, Schmitz, and Baer (2010) found that when diagnosing major depressive disorder the impairment specifier was redundant and that the use of the impairment of functioning alone to diagnose major depressive disorder resulted in a very high number of false positives. That said a single symptom is quite different from a diagnosis, which involves a cluster of symptoms. In the context of screening for psychopathology future research could determine whether the ARI total, impairment item, or both is ideal. In the context of the clinical setting it would be important for the clinician to determine whether irritability is impacting on a patient's functioning so that treatment can be targeted toward areas that will improve functioning.

The widely held belief that people are more irritable during adolescence than at any other stage of their life may not be accurate. As the current study included an adult sample that was skewed toward young adults only tentative inferences can be drawn about irritability past young adulthood. The results indicate that, in young adulthood at least, irritability is

reported at a similar, though slightly higher, level to that reported by adolescents. However adolescents are more likely to experience impairing irritability in the absence of mental health problems. An implication of this is that there is a group of adolescents who are to some degree impaired by irritability suggesting that some sort of intervention would be desirable, particularly given the long term associations of irritability during adolescence. These adolescents however, do not fit into current diagnostic systems. The DSM-5 has improved upon DSM-IV by the inclusion of cross-cutting symptoms. However, if these adolescents have no mental health issues other than irritability then clinicians have no adequate way in which to describe the condition. As treatment is guided by the diagnosis assigned to a patient and, as discussed in section 2.5, little research exists to guide the treatment of irritability this is problematic.

It may be the increased likelihood for otherwise mentally healthy adolescents to experience impairing irritability that has led to the belief that adolescents are highly irritable. If one assumes that irritability expressed in some behavioural manifestation has the greatest impact on a person's functioning, and one also accepts that adolescents have not had the time to develop adequate emotion regulation skills to be able to prevent their irritability from being expressed verbally and behaviourally one can see how adolescents may be perceived as being more irritable. Mentally healthy adults however, have had greater opportunity to develop these emotion regulation skills which may be why irritability tends not to be such an issue in their lives.

The level of association between depressive symptoms and irritability was the same for both the adolescent and adult sample. This implies that irritability may continue to be of relevance to adult depressive disorders, at least for young adults, despite it not being included as a symptom by DSM-5 (APA, 2013). It may be that the symptom does decrease in its relevance to depressive disorders with age, as studies have shown irritability is more

prevalent in children with depression than in adolescents with depression (Borchardt & Meller, 1996) and that younger adults are more likely to experience irritability with depression than older adults (Perlis et al., 2005).

7.9 Conclusions

Given the recent interest in the symptom of irritability and the inclusion of DMDD and cross-cutting symptoms (including irritability) in DSM-5, the findings presented in this thesis are highly relevant. Adolescents may be more likely than young adults to experience impairing irritability in the absence of other mental health problems. The long term negative sequelae of irritability during adolescence (i.e. suicide and development of internalising disorders) make this finding particularly concerning. As well as this irritability may be able to act as a marker of psychopathology during adolescence. Finally this thesis has provided initial evidence to suggest that irritability should perhaps be considered as important to depressive disorders in young adults given the high level of association between irritability and depressive symptoms.

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Appendix A: Diagnostic criteria for Disruptive Mood Dysregulation Disorder

A. Severe recurrent temper outbursts manifested verbally (e.g. verbal rages) and/or behaviourally (e.g. physical aggression toward people or property) that are grossly out of proportion in intensity or duration to the situation or provocation.

B. The temper outbursts are inconsistent with developmental level.

C. The temper outbursts occur, on average, three or more times per week.

D. The mood between temper outbursts is persistently irritable or angry most of the day, nearly every day, and is observable by others (e.g. parents, teachers, peers).

E. Criteria A-D have been present for 12 or more months. Throughout that time, the individual has not had a period lasting 3 or more consecutive months without all of the symptoms in Criteria A-D.

F. Criteria A and D are present in at least two of three settings (i.e., at home, at schools, with peers) and are severe in at least one of these.

G. The diagnosis should not be made for the first time before age 6 years or after age 18 years.

H. By history or observation, the age at onset of Criteria A-E is before 10 years.

I. There has never been a distinct period lasting more than 1 day during which the full symptom criteria, except duration, for a manic or hypomanic episode have been met.

   Note: Developmentally appropriate mood elevation, such as occurs in the context of a highly positive event or its anticipation, should not be considered as a symptom of mania or hypomania.

J. The behaviours do not occur exclusively during an episode of major depressive disorder and are not better explained by another mental disorder (e.g. autism spectrum disorder, posttraumatic stress disorder, separation anxiety disorder, persistent depressive disorder [dysthymia]).

Note: This diagnosis cannot coexist with oppositional defiant disorder, intermittent explosive disorder, or bipolar disorder, though it can coexist with others, including major depressive disorder, attention-deficit/hyperactivity disorder, conduct disorder, and substance use disorders. individuals whose symptoms meet criteria for both disruptive mood dysregulation disorder and oppositional defiant disorder should only be given the diagnosis of disruptive mood dysregulation disorder. If an individual has ever experienced a manic or hypomanic episode, the diagnosis of disruptive mood dysregulation disorder should not be assigned.

K. The symptoms are not attributable to the physiological effects of a substance or to another medical or neurological condition.

Appendix B: Study questionnaires

Demographic Questionnaire (adolescents)

1. What is your relationship to the child? _____
2. What is the child's date of birth?_____
3. Is your child (please circle one) male female
4. What is the highest level of education the child's parents have achieved?

Mother (please circle one)

a. Primary school
b. Some high school
c. Completed high school
d. Trade/certificate
e. Bachelor degree
f. Post graduate degree

Father (please circle one)

a. Primary school
b. Some high school
c. Completed high school
d. Trade/certificate
e. Bachelor degree
f. Post graduate degree

Demographic Questionnaire (adults)

1. How old are you (years)? _____
2. Are you (please circle one) male female
3. What is the highest level of education you have completed?
    a. Primary school
    b. Some high school
    c. Completed high school
    d. Trade/certificate
    e. Bachelor degree
    f. Post graduate degree
4. What is your postcode? _____

ARI - **S**

Name of participant: Age:

For each item, please mark the box for Not True, Somewhat True or Certainly True.
In the last six months and compared to others of the same age, how well does each of the following statements describe your behavior/feelings? Please try to answer all questions.

	NOT TRUE	SOMEWHAT TRUE	CERTAINLY TRUE
I am easily annoyed by others	☐	☐	☐
I often lose my temper	☐	☐	☐
I stay angry for a long time	☐	☐	☐
I am angry most of the time	☐	☐	☐
I get angry frequently	☐	☐	☐
I lose my temper easily	☐	☐	☐
Overall, my irritability causes me problems.	☐	☐	☐

THANK YOU VERY MUCH FOR YOUR HELP.

ARI - **P**

Name of participant: Age:

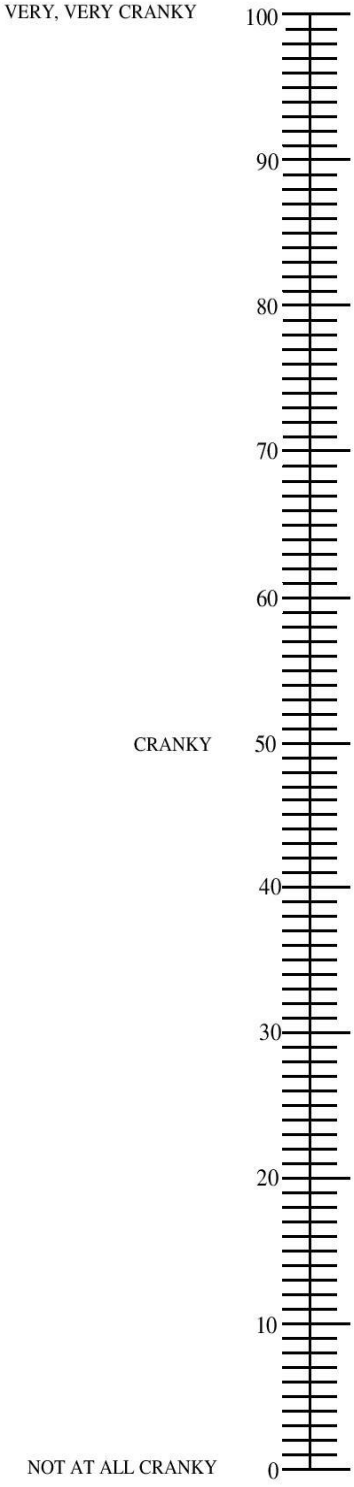
For each item, please mark the box for Not True, Somewhat True or Certainly True.
In the last six months and compared to others of the same age, how well does each of the following statements describe the behavior/feelings of your child? Please try to answer all questions.

	NOT TRUE	SOMEWHAT TRUE	CERTAINLY TRUE
Is easily annoyed by others	☐	☐	☐
Often loses his/her temper	☐	☐	☐
Stays angry for a long time	☐	☐	☐
Is angry most of the time	☐	☐	☐
Gets angry frequently	☐	☐	☐
Loses temper easily	☐	☐	☐
Overall, irritability causes him/her problems.	☐	☐	☐

THANK YOU VERY MUCH FOR YOUR HELP.

Feelings Thermometer

Name:_____ Date:_____



Think of the worst day in the past 2 weeks, how cranky/irritable/ annoyed did you feel that day?

Strengths and Difficulties Questionnaire

P or T [11-17]

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain. Please give your answers on the basis of this young person's behaviour over the last six months or this school year.

Young person's name ..... Male/Female

Date of birth.....

	Not True	Somewhat True	Certainly True
Considerate of other people's feelings	☐	☐	☐
Restless, overactive, cannot stay still for long	☐	☐	☐
Often complains of headaches, stomach-aches or sickness	☐	☐	☐
Shares readily with other youth, for example books, games, food	☐	☐	☐
Often loses temper	☐	☐	☐
Would rather be alone than with other youth	☐	☐	☐
Generally well behaved, usually does what adults request	☐	☐	☐
Many worries or often seems worried	☐	☐	☐
Helpful if someone is hurt, upset or feeling ill	☐	☐	☐
Constantly fidgeting or squirming	☐	☐	☐
Has at least one good friend	☐	☐	☐
Often fights with other youth or bullies them	☐	☐	☐
Often unhappy, depressed or tearful	☐	☐	☐
Generally liked by other young people	☐	☐	☐
Easily distracted, concentration wanders	☐	☐	☐
Nervous in new situations, easily loses confidence	☐	☐	☐
Kind to younger children	☐	☐	☐
Often lies or cheats	☐	☐	☐
Picked on or bullied by other young people	☐	☐	☐
Often volunteers to help others (parents, teachers, children)	☐	☐	☐
Thinks things out before acting	☐	☐	☐
Steals from home, school or elsewhere	☐	☐	☐
Gets along better with adults than with other young people	☐	☐	☐
Many fears, easily scared	☐	☐	☐
Good attention span, sees tasks through to the end	☐	☐	☐

Signature ..... Date .....

Parent / Teacher / Other (Please specify):

Thank you very much for your help

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Strengths and Difficulties Questionnaire S 11-17

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain . Please give your answers on the basis of how things have been for you over the last six months.

Your name..... Male/Female

Date of birth.....

	Not True	Somewhat True	Certainly True
I try to be nice to other people. I care about their feelings	☐	☐	☐
I am restless, I cannot stay still for long	☐	☐	☐
I get a lot of headaches, stomach-aches or sickness	☐	☐	☐
I usually share with others, for example CD's, games, food	☐	☐	☐
I get very angry and often lose my temper	☐	☐	☐
I would rather be alone than with people of my age	☐	☐	☐
I usually do as I am told	☐	☐	☐
I worry a lot	☐	☐	☐
I am helpful if someone is hurt, upset or feeling ill	☐	☐	☐
I am constantly fidgeting or squirming	☐	☐	☐
I have one good friend or more	☐	☐	☐
I fight a lot. I can make other people do what I want	☐	☐	☐
I am often unhappy, depressed or tearful	☐	☐	☐
Other people my age generally like me	☐	☐	☐
I am easily distracted, I find it difficult to concentrate	☐	☐	☐
I am nervous in new situations. I easily lose confidence	☐	☐	☐
I am kind to younger children	☐	☐	☐
I am often accused of lying or cheating	☐	☐	☐
Other children or young people pick on me or bully me	☐	☐	☐
I often volunteer to help others (parents, teachers, children)	☐	☐	☐
I think before I do things	☐	☐	☐
I take things that are not mine from home, school or elsewhere	☐	☐	☐
I get along better with adults than with people my own age	☐	☐	☐
I have many fears, I am easily scared	☐	☐	☐
I finish the work I'm doing. My attention is good	☐	☐	☐

Your Signature .....

Today's Date .....

Thank you very much for your help

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RADS-2 Test Booklet

by William M. Reynolds, PhD

Name _____ Age _____ Sex: ☐ Male ☐ Female Today's Date: ___/___/___ (Mo. Day Yr.)

Grade in School: _____ Ethnicity/Race: _____ School/Agency _____

Directions: Listed below are some sentences about how you feel. Read each sentence and decide how often you feel this way. Decide if you feel this way almost never, hardly ever, sometimes, or most of the time. To answer each item, circle the number under the answer that best describes how you really feel. Remember, there are no right or wrong answers. Just choose the answer that tells how you usually feel.

		Almost never	Hardly ever	Some-times	Most of the time
1.	I feel happy	1	2	3	4
2.	I worry about school	1	2	3	4
3.	I feel lonely	1	2	3	4
4.	I feel my parents don't like me	1	2	3	4
5.	I feel important	1	2	3	4
6.	I feel like hiding from people	1	2	3	4
7.	I feel sad	1	2	3	4
8.	I feel like crying	1	2	3	4
9.	I feel that no one cares about me	1	2	3	4
10.	I feel like having fun with other students	1	2	3	4
11.	I feel sick	1	2	3	4
12.	I feel loved	1	2	3	4
13.	I feel like running away	1	2	3	4
14.	I feel like hurting myself	1	2	3	4
15.	I feel that other students don't like me	1	2	3	4
16.	I feel upset	1	2	3	4
17.	I feel life is unfair	1	2	3	4
18.	I feel tired	1	2	3	4
19.	I feel I am bad	1	2	3	4
20.	I feel I am no good	1	2	3	4
21.	I feel sorry for myself	1	2	3	4
22.	I feel mad about things	1	2	3	4
23.	I feel like talking to other students	1	2	3	4
24.	I have trouble sleeping	1	2	3	4
25.	I feel like having fun	1	2	3	4
26.	I feel worried	1	2	3	4
27.	I get stomachaches	1	2	3	4
28.	I feel bored	1	2	3	4
29.	I like eating meals	1	2	3	4
30.	I feel like nothing I do helps any more	1	2	3	4

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Center for Epidemiologic Studies Depression Scale (CES-D), NIMH

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

	During the Past Week			
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	☐	☐	☐	☐
2. I did not feel like eating; my appetite was poor.	☐	☐	☐	☐
3. I felt that I could not shake off the blues even with help from my family or friends.	☐	☐	☐	☐
4. I felt I was just as good as other people.	☐	☐	☐	☐
5. I had trouble keeping my mind on what I was doing.	☐	☐	☐	☐
6. I felt depressed.	☐	☐	☐	☐
7. I felt that everything I did was an effort.	☐	☐	☐	☐
8. I felt hopeful about the future.	☐	☐	☐	☐
9. I thought my life had been a failure.	☐	☐	☐	☐
10. I felt fearful.	☐	☐	☐	☐
11. My sleep was restless.	☐	☐	☐	☐
12. I was happy.	☐	☐	☐	☐
13. I talked less than usual.	☐	☐	☐	☐
14. I felt lonely.	☐	☐	☐	☐
15. People were unfriendly.	☐	☐	☐	☐
16. I enjoyed life.	☐	☐	☐	☐
17. I had crying spells.	☐	☐	☐	☐
18. I felt sad.	☐	☐	☐	☐
19. I felt that people dislike me.	☐	☐	☐	☐
20. I could not get "going."	☐	☐	☐	☐

SCORING: zero for answers in the first column, 1 for answers in the second column, 2 for answers in the third column, 3 for answers in the fourth column. The scoring of positive items is reversed. Possible range of scores is zero to 60, with the higher scores indicating the presence of more symptomatology.

GAD-7

Identifier _____ Date _____

Please read each statement and record a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past two weeks. There are no right or wrong answers. Do not spend too much time on any one statement. This assessment is not intended to be a diagnosis. If you are concerned about your results in any way, please speak with a qualified health professional.

0 = Not at all 1 = Several days 2 = More than half the days 3 = Nearly every day

1	Feeling nervous, anxious or on edge	
2	Not being able to stop or control worrying	
3	Worrying too much about different things	
4	Trouble relaxing	
5	Being so restless that it is hard to sit still	
6	Becoming easily annoyed or irritable	
7	Feeling afraid as if something awful might happen	

Total GAD-7 score = _____

Privacy - please note - this form neither saves nor transmits any information about you or your assessment scores. If you wish to keep your results you will need to print this document. These results are intended as a guide to your health and are presented for educational purposes only. They are not intended to be a clinical diagnosis. If you are concerned in any way about your health, please consult with a qualified health professional.

Liebowitz Social Anxiety Scale

Liebowitz MR. Social Phobia. Mod Probl Pharmacopsychiatry 1987;22:141-173

Pt Name:		Pt ID #:
Date:	Clinic #:	Assessment point:

Fear or Anxiety:
0 = None
1 = Mild
2 = Moderate
3 = Severe

Avoidance:
0 = Never (0%)
1 = Occasionally (1—33%)
2 = Often (33—67%)
3 = Usually (67—100%)

	Fear or Anxiety	Avoidance	
1. Telephoning in public. (P)			1.
2. Participating in small groups. (P)			2.
3. Eating in public places. (P)			3.
4. Drinking with others in public places. (P)			4.
5. Talking to people in authority. (S)			5.
6. Acting, performing or giving a talk in front of an audience. (P)			6.
7. Going to a party. (S)			7.
8. Working while being observed. (P)			8.
9. Writing while being observed. (P)			9.
10. Calling someone you don't know very well. (S)			10.
11. Talking with people you don't know very well. (S)			11.
12. Meeting strangers. (S)			12.
13. Urinating in a public bathroom. (P)			13.
14. Entering a room when others are already seated. (P)			14.
15. Being the center of attention. (S)			*15.*
16. Speaking up at a meeting. (P)			16.
17. Taking a test. (P)			17.
18. Expressing a disagreement or disapproval to people you don't know very well. (S)			18.
19. Looking at people you don't know very well in the eyes. (S)			19.
20. Giving a report to a group. (P)			20.
21. Trying to pick up someone. (P)			21.
22. Returning goods to a store. (S)			22.
23. Giving a party. (S)			23.
24. Resisting a high pressure salesperson. (S)			24.

Appendix C: Advertising material

Information contained on a Facebook page and in an email

Irritability in adolescents: Prevalence and clinical correlates

We invite people aged between 20 and 65 years of age to participate in a study investigating irritability.

My name is Melissa Mulraney and I am a student from Monash University. I am currently completing a PhD in the area of Psychology under the supervision of Dr Glenn Melvin and Prof. Bruce Tonge from the Monash University School of Psychology and Psychiatry.

We aim to investigate whether the popular belief that adolescents are more irritable than adults is actually true. We also will investigate associations between irritability and mental health.

Participation involves completing a 15 minute survey asking about your irritability and some other thoughts, feelings, and behaviours. Participants can choose to go into a prize draw to win one of four Coles Myer gift vouchers valued at $50 each.

<insert link here>

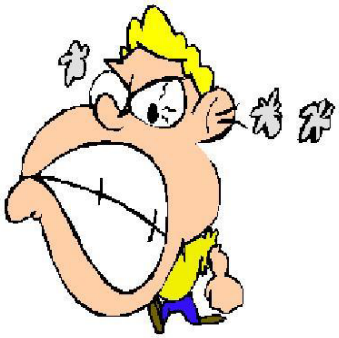
Please feel free to contact me if you have any questions or wish to complete a hard-copy form of the survey. Findings from this research will help clarify knowledge and explore links between irritability and mental health. They may also contribute to programs and interventions aimed at managing mood and emotions, particularly in adolescents.

For more information contact: Melissa Mulraney
Monash University Centre for Developmental Psychiatry & Psychology
[redacted]

MONASH University

Southern Health

Are teenagers more irritable than adults?



We invite people aged between 20 and 65 years of age to participate in a study investigating irritability.

My name is Melissa Mulraney and I am a student from Monash University. I am currently completing a PhD in the area of Psychology under the supervision of Dr Glenn Melvin and Prof. Bruce Tonge from the Monash University School of Psychology and Psychiatry.

We aim to investigate whether the popular belief that adolescents are more irritable than adults is actually true. We also will investigate associations between irritability and mental health.

Participation involves completing a 15 minute survey asking about your irritability and some other thoughts, feelings, and behaviours. Participants can chose to go into a prize draw to win one of four Coles Myer gift vouchers valued at $50 each. To participate either go to the URL below or go to the Facebook page 'Monash University & Southern Health Irritability Study' and follow the link.

Please feel free to contact me if you have any questions or wish to complete a hard-copy form of the survey.

Findings from this research will help clarify knowledge and explore links between irritability and mental health. They may also contribute to programs and interventions aimed at managing mood and emotions, particularly in adolescents.

For more information contact: Melissa Mulraney
Monash University Centre for Developmental Psychiatry & Psychology
[redacted]

http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg http://bit.ly/Kuo3fg

Appendix D: Ethics approval and consent forms

19 April 2011

Dr Glenn Melvin
Lecturer
Centre for Developmental Psychiatry & Psychology
Monash University Centre for Developmental Psychiatry & Psychology
Building 1, 270 Ferntree Gully Rd
Notting Hill 3168 VIC Australia

Dear Dr Glenn Melvin

Study title: Irritability in adolescents : Prevalence and clinical correlates

Southern Health HREC Ref: 10349A:

The Southern Health HREC A reviewed the above application at the meeting held on 02 December 2010 In addition, the HREC is satisfied that the responses to our correspondence of 8 December 2010 have been sufficiently addressed.

The HREC approved the above application on the basis of the information provided in the application form, protocol and supporting documentation.

Approval

The HREC approval is from the date of this letter.

Approval is given in accordance with the research conforming to the *National Health and Medical Research Council Act 1992* and the *National Statement on Ethical Conduct in Human Research (2007)*. The HREC has ethically approved this research according to the Memorandum of Understanding between the Consultative Council and the participating organisations conducting the research.

Approval is given for this research project to be conducted at the following sites and campuses:

- Monash Medical Centre – Clayton Campus

You must comply with the following conditions:

The Chief Principal Investigator is required to notify the Administrative Officer, Research Directorate, Southern Health of:

1. Any change in protocol and the reason for that change together with an indication of ethical implications (if any)
2. Serious or unexpected adverse effects of project on subjects and steps taken to deal with them
3. Any unforeseen events that might affect continued ethical acceptability of the project

4. Any expiry of the insurance coverage provided in respect of sponsored trials
5. Discontinuation of the project before the expected date of completion, giving reasons
6. Any change in personnel involved in the research project including any study member resigning from Southern Health &/or the study team.

At the conclusion of the project or every twelve months if the project continues, the Principal Investigator is required to complete and forward an annual report to the Committee.

Annual report forms will be forwarded to the researcher.

Approved documents

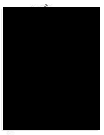
Documents reviewed and approved at the meeting were:

Document	*Version*	*Date*
Participant Information and Consent Form Clinical Participants	3	18 April 2011
Participant Information and Consent Form Clinical Parents/Guardians	2	13 December 2010

If you should have any queries about your project please contact Deborah Dell or Julie Gephart by email deborah.dell@southernhealth.org.au /julie.gephart@southernhealth.org.au

The HREC wishes you and your colleagues every success in your research.

Yours sincerely



Dr Ian Woolley
Medical Administrator

Cc: MUHREC

Department of Education and Early Childhood Development

Office for Policy, Research and Innovation

2 Treasury Place
East Melbourne, Victoria 3002
Telephone: +61 3 9637 2000
DX 210083
GPO Box 4367
Melbourne, Victoria 3001

2011_000990

Dr Glenn Melvin
Centre for Developmental Psychiatry and Psychology
Monash University
Building 1, 270 Ferntree Gully Road
NOTTING HILL 3168

Dear Dr Melvin

Thank you for your application of 14 February 2011 in which you request permission to conduct research in Victorian government schools and/or early childhood settings titled *Irritability in adolescents: prevalence and clinical correlates.*

I am pleased to advise that on the basis of the information you have provided your research proposal is approved in principle subject to the conditions detailed below.

1. The research is conducted in accordance with the final documentation you provided to the Department of Education and Early Childhood Development.

2. Separate approval for the research needs to be sought from school principals and/or centre directors and this is to be supported by the DEECD approved documentation and the letter of approval from a relevant and formally constituted Human Research Ethics Committee.

3. The project is commenced within 12 months of this approval letter and any extensions or variations to your study, including those requested by an ethics committee must be submitted to the Department of Education and Early Childhood Development for its consideration before you proceed.

4. As a matter of courtesy, you advise the relevant Regional Director of the schools or early childhood settings that you intend to approach. An outline of your research and a copy of this letter should be provided to the Regional Director.

5. You acknowledge the support of the Department of Education and Early Childhood Development in any publications arising from the research.

6. The Research Agreement conditions, which include the reporting requirements at the conclusion of your study, are upheld. A reminder will be sent for reports not submitted by the study's indicative completion date.

I wish you well with your research study. Should you have further enquiries on this matter, please contact Kathleen Nolan, Research Officer, Education Policy and Research, by telephone [redacted]

Yours sincerely

[redacted]

Dr Elizabeth Hartnell-Young
Group Manager
Education Policy and Research

06/04/2011

enc

Catholic Education Office
Archdiocese of Melbourne

In reply please quote:

GE11/0009
1695

19 May 2011

Ms M Mulraney
Building 1, 270 Ferntree Gully Road
NOTTING HILL VIC 3168

Dear Ms Mulraney

I am writing with regard to your research application received on 8 April 2011 concerning your forthcoming project titled *Irritability in adolescents: Prevalence and clinical correlates.* You have asked approval to approach Catholic schools in the Archdiocese of Melbourne, as you wish to survey Year 7–12 students.

I am pleased to advise that your research proposal is approved in principle subject to the nine standard conditions outlined below.

1. The decision as to whether or not research can proceed in a school rests with the school's principal, so you will need to obtain approval directly from the principal of each school that you wish to involve.

2. You should provide each principal with an outline of your research proposal and indicate what will be asked of the school. A copy of this letter of approval, and a copy of notification of approval from the university's Ethics Committee, should also be provided.

3. A *Working with Children* (WWC) check – or registration with the Victorian Institute of Teaching (VIT) – is necessary for all researchers visiting schools. Appropriate documentation must be shown to the principal before starting the research in each school.

4. No student is to participate in the research study unless s/he is willing to do so and informed consent is given in writing by a parent/guardian.

5. You should provide the names of schools which agree to participate in the research project to the Knowledge Management Unit of this Office.

6. Any substantial modifications to the research proposal, or additional research involving use of the data collected, will require a further research approval submission to this Office.

James Goold House. 228 Victoria Parade, East Melbourne VIC 8002 Tel: (+61 3) 9267 0228 Fax: (+61 3) 9415 9325
Correspondence: PO Box 3, East Melbourne VIC 8002 Email: director@ceomelb.catholic.edu.au www.ceomelb.catholic.edu.au
ABN 85 176 448 204

7. Data relating to individuals or schools are to remain confidential.

8. Since participating schools have an interest in research findings, you should consider ways in which the results of the study could be made available for the benefit of the school communities.

9. At the conclusion of the study, a copy or summary of the research findings should be forwarded to this Office. It would be appreciated if you could submit your report in an ***electronic format*** using the email address provided below.

I wish you well with your research study. If you have any queries concerning this matter, please contact Mr Mark McCarthy of this Office.

The email address is [redacted]

Yours sincerely

[redacted]

DEPUTY DIRECTOR

Participant Information and Consent Form Clinical Parents/Guardians

Full Project Title: Irritability in adolescents: Prevalence and clinical correlates.

Principal Researcher: Dr. Glenn Melvin

Associate Researchers: Professor Bruce Tonge

Ms. Melissa Mulraney

Dr. Michael Gordon

1. Introduction

You are invited to take part in this research project. This is because you have a child aged 11-19 receiving treatment for a mental health problem. The research project aims to investigate the nature of irritability; how it is influenced by levels of psychological and behavioural problems and how it differs between various mental health problems and between healthy adolescents and those who have a mental health problem.

This Participant Information and Consent Form tells you about the research project. It explains what is involved to help you decide if you want to take part.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or your local health worker.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. You are receiving this information prior to your child being given any information about the project.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read;
- Consent to take part in the research project;
- Consent to be involved in the procedures described;
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

2. What is the purpose of this research project?

This project aims to extend knowledge about irritability and how it differs between healthy adolescents and those with a mental health problem. High levels of irritability in adolescence can increase risk for mental health problems. Through this research we hope to identify at what level the risk increases, which will inform future research and development of interventions. We also hope to identify how irritability differs between various mental disorders, which will inform treatment. The results of this research will be used by the researcher Melissa Mulraney to obtain a PhD.

3. What does participation in this research project involve?

- **Procedures**

Participation in this research will involve you completing a demographic questionnaire, an irritability questionnaire, and a psychological screening questionnaire. The questionnaires should take approximately 20 minutes to complete. You can complete the questionnaires in your own time and you will be given a reply paid envelope to return them in, or you can complete them while your child is completing their questionnaires, or you can arrange a time with the researcher to complete the questionnaires over the phone. Once you have completed your questionnaires your child will be asked to complete the irritability measure and psychological screening measure, as well as a measure of depression. This must be done while a researcher is present and will take approximately 30 minutes. We will also require diagnostic information regarding your child so by agreeing to participate in the research you are also agreeing to the researcher obtaining this information and test scores from your child's case manager. You will be informed of the information that is provided by the case manager. The information gathered by the researcher may be of interest to your case manager so if you agree to providing them with any information gathered please tick the appropriate box on the consent form.

- **Reimbursement**

You will not be paid for your participation in this research, but you and your child will be entered into a prize draw to win one of four department store vouchers valued at $50.

4. What are the possible benefits?

Participating in this study will not be of any direct benefit to you. However, the findings will contribute to our knowledge of the nature of irritability, and help to establish clear links between this behaviour and depression, anxiety, and behavioural problems. The results of the research have the potential to contribute to programs or interventions aimed at the successful management of mood, emotions, and behavioural problems, particularly in adolescents.

5. What are the possible risks?

Some of the questionnaires contain sensitive questions around moods, emotions and behaviours that may cause some children distress. If this happens your child will be reminded that they do not have to complete the questionnaires if they do not wish to. The researcher will also arrange for counselling or other appropriate support. Any counselling or support will be provided by staff who are not members of the research team.

6. Do I have to take part in this research project?

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at a later stage. If you decide to withdraw, please notify a member of the research team.

Your decision whether to take part or not, or to take part and then withdraw, will not affect your relationship with the researchers or the service.

7. How will I be informed of the final results of this research project?

A plain English summary of results will be made available to participants upon completion of the study.

8. What will happen to information about me?

Any information obtained in connection with this research that can identify you or your child will remain confidential. It will only be disclosed with your permission. The results of this study may be used in future research examining similar constructs; however, as personal information will be destroyed before this happens, no one will be able to identify your individual results. The information obtained will be kept in a locked storage cabinet at Monash University for five years after which it will be destroyed. During those five years only the researchers named in this form will have access to the information. In any publication or presentation, including the thesis that will be produced from this research, information will be provided in such a way that you and your child cannot be identified.

9. Can I access research information kept about me?

In accordance with relevant Australian privacy and other relevant laws, you have the right to access the information collected and stored by the researcher about you and your child. Please contact one of the researcher named at the end of this document if you would like to access your information.

In addition, in accordance with regulatory guidelines, the information collected in this research project will be kept for at least five years.

10. Is this research project approved?

The ethical aspects of this research project have been approved by the Human Research Ethics Committee of Southern Health and Monash University.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)* produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

11. Who can I contact?

The person you may need to contact will depend on the nature of your query. Therefore, please note the following:

For further information or appointments:

If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project (for example, feelings of distress), you can contact the principal researcher on [redacted] or any of the following people:

Name: Melissa Mulraney

Role: Associate researcher

Telephone: [redacted]

For complaints:

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about being a research participants in general, then you may contact:

Name: Ms. Majar Thiagarajan

Position: **Director Research Services**

Telephone: [redacted]

12. Consent

I have read or have had this document read to me in a language I understand, and I understand the purposes, procedures and risks of this research project as described within it.

I have had an opportunity to ask questions and I am satisfied with the answers I have received. I give my permission for _____to participate in this research project according to the conditions outlined in this document.

Participant's name (printed) ……

Name of person giving consent (printed) ……

Relationship to participant: ……

Signature Date

☐ **I wish for any information gathered by the researcher's to be made available to my child's case manager.** ***Please tick box if this is the case.***

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's name (printed) ……

Signature Date

Note: All parties signing the consent section must date their own signature.

13. Assent (to be completed by participants under the age of 18)

I have discussed this project with my parent or guardian and I understand the purposes, procedures and risks of this project as described in this document.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project, as described.

Participant's name (printed) ……

Signature Date

Participant Information and Consent Form Clinical Participants

Full Project Title: Irritability in adolescents: Prevalence and clinical correlates.

Principal Researcher: Dr. Glenn Melvin

Associate Researchers: Professor Bruce Tonge

Ms. Melissa Mulraney

Dr. Michael Gordon

1. Introduction

You are invited to take part in this research project. This is because you are aged 11-19 years and are receiving treatment for a mental health problem. The research project aims to find out more about irritability; how it is changed by levels of depressive symptoms (feeling sad), anxiety (feeling worried), and behavioural problems and how it differs between various mental health problems, and between healthy adolescents and those who have a mental health problem.

This Participant Information and Consent Form tells you about the research project. It explains what is involved to help you decide if you want to take part.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or your local health worker.

Participation in this research is voluntary. If you don't wish to take part, you don't have to.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read;
- Consent to take part in the research project;
- Consent to be involved in the procedures described;
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

2. What is the purpose of this research project?

This project aims to extend knowledge about irritability and how it differs between healthy adolescents and those with a mental health problem. High levels of irritability in adolescence can increase risk for mental health problems. Through this research we hope to identify at what level the risk increases, which will inform future research and development of interventions. We also hope to identify how irritability differs between various mental disorders, which will inform treatment. The results of this research will be used by the researcher Melissa Mulraney to obtain a PhD.

3. What does participation in this research project involve?

- **Procedures**

Participation in this research will involve you and your parents completing a booklet of questionnaires. These questions will ask you about your irritability, moods, feelings, and behaviours. Answering the question in this booklet will take around 30 minutes. Your parents will complete the questionnaire booklet before you are given yours to complete. We will also need some information from your case manager so by agreeing to participate in the research you are also agreeing to the researcher obtaining this information from your case manager. You will be informed of any information provided by your case manager. The information gathered by the researcher may be of interest to your case manager so if you agree to providing them with any information gathered please tick the appropriate box on the consent form.

- **Reimbursement**

You will not be paid for your participation in this research, but you will be entered into a prize draw to win one of four department store vouchers valued at $50.

4. What are the possible benefits?

Taking part in this study will not be of direct help to you. However, it will help us to find out more about irritability, and how it is linked to depression, anxiety, the way we express our emotions, and the way we behave. The findings of the research can help others to develop programs that plan to deal with mood and emotions, especially in teenagers.

5. What are the possible risks?

Some of the questionnaires in this booklet have sensitive questions about moods, emotions, and behaviours that may make you feel uncomfortable or upset. If this happens you do not have to complete the booklet if you do not wish to. If you need, the case manager will be available for you to talk to during and after doing the questions in the booklet.

6. Do I have to take part in this research project?

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at a later stage. If you decide to withdraw, please notify a member of the research team.

Your decision whether to take part or not, or to take part and then withdraw, will not affect your relationship with the researchers or the service.

7. How will I be informed of the final results of this research project?

A plain English summary of results will be made available to participants upon completion of the study.

8. What will happen to information about me?

When everybody's answers are put into the report, no one will be able to know which answers belong to you. Monash University needs all the data collected to be stored in a locked cupboard for 7 years. A report of the study may be given in for publication. People who took part in the study though, will not be able to be identified or recognised from this report. Your results from this study may be used in future research exploring similar signs and behaviours; however, as personal information will be destroyed before this happens, no one will be able to identify your results.

9. Can I access research information kept about me?

In accordance with relevant Australian privacy and other relevant laws, you have the right to access the information collected and stored by the researcher about you. Please contact one of the researcher named at the end of this document if you would like to access your information.

In addition, in accordance with regulatory guidelines, the information collected in this research project will be kept for at least five years.

10. Is this research project approved?

The ethical aspects of this research project have been approved by the Human Research Ethics Committee of Southern Health and Monash University.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)* produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

11. Who can I contact?

The person you may need to contact will depend on the nature of your query. Therefore, please note the following:

For further information or appointments:

If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project (for example, feelings of distress), you can contact the principal researcher on [redacted] or any of the following people:

Name: Melissa Mulraney

Role: Associate researcher

Telephone: [redacted]

For complaints:

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about being a research participants in general, then you may contact:

Name: Ms. Majar Thiagarajan

Position: **Director Research Services**

Telephone: [redacted]

12. Consent

I have read, or have had this document read to me in a language that I understand, and I understand the purposes, procedures and risks of this research project as described within it.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project, as described.

I understand that I will be given a signed copy of this document to keep.

☐ **I wish for any information gathered by the researcher's to be made available to my case manager.** ***Please tick box if this is the case.***

Participant's name (printed) ……

Signature Date

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's name (printed) ……

Signature Date

Note: All parties signing the consent section must date their own signature.

Participant Information and Consent Form School Parents/Guardians

Full Project Title: Irritability in adolescents: Prevalence and clinical correlates.

Principal Researcher: Dr. Glenn Melvin

Associate Researchers: Professor Bruce Tonge

Ms. Melissa Mulraney

Dr. Michael Gordon

Miss Romy Briner

1. Introduction

You are invited to take part in this research project. This is because you have a child aged 11-19. The research project aims to investigate the level and type of irritability present in healthy adolescents, and to determine how irritability differs between healthy adolescents and those who have a mental health problem. The project also aims to investigate what types of situations trigger irritability in the adolescent, and whether there are differences between parent perspectives and adolescent perspectives regarding these triggers.

This Participant Information and Consent Form tells you about the research project. It explains what is involved to help you decide if you want to take part.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or your local health worker.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. You are receiving this information prior to your child being given any information about the project.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read;
- Consent to take part in the research project;
- Consent to be involved in the procedures described;
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

2. What is the purpose of this research project?

This project aims to extend knowledge about irritability and how it differs between healthy adolescents and those with a mental health problem. High levels of irritability in adolescence can increase risk for mental health problems. Through this research we hope to identify at what level the risk increases, which will inform future research and development of interventions. We also hope to identify how irritability differs between various mental disorders, which will inform treatment. Finally, we also hope to identify what types of situations trigger irritability in adolescents as we believe that such

information will serve to inform the prevention and treatment of adolescent irritability as well as its associated mental health problems. The results of this research will be used by the researcher Melissa Mulraney to obtain a PhD.

3. What does participation in this research project involve?

- **Procedures**

Participation in this research will involve your child completing a psychological screening measure, a measure of depression, and questionnaires asking about your child's irritability. This should take approximately 20 minutes. You are asked to complete the consent form and return it in the envelope provided to the school or directly to the researcher as soon as possible.

We wish to be able to give feedback on these procedures which may indicate the possibility of your child suffering a mental health problem. If you wish to be informed could you please provide a phone number. We will also ask you to complete some parent-report measures over the phone, this should take approximately 10 minutes.

- **Reimbursement**

You will not be paid for your participation in this research.

4. What are the possible benefits?

Participation in this research may be of no direct benefit to you or your child. The screening questionnaires you and your child will be completing are able to indicate the possibility of a mental health problem. They are only screening tools and not diagnostic but if your child appear to be in some distress you can choose to be notified and informed of the ways in which you can seek further assessment or help for your child.

5. What are the possible risks?

Some of the questionnaires contain sensitive questions around moods and emotions that may cause some children discomfort. If this happens your child will be reminded that they do not have to complete the questionnaires if they do not wish to. The researcher will also arrange for counselling or other appropriate support. Any counselling or support will be provided by staff who are not members of the research team.

6. Do I have to take part in this research project?

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at a later stage. If you decide to withdraw, please notify a member of the research team.

Your decision whether to take part or not, or to take part and then withdraw, will not affect your relationship with the researchers or the school.

7. How will I be informed of the final results of this research project?

A plain English summary of results will be made available to participants upon completion of the study.

8. What will happen to information about me?

Any information obtained in connection with this research that can identify you or your child will remain confidential. It will only be disclosed with your permission. The results of this study may be used in future research examining similar constructs; however, as personal information will be destroyed before this happens, no one will be able to identify your individual results. The information obtained will be kept in a locked storage cabinet at Monash University for seven years after which it will be destroyed. During those seven years only the researchers named in this form will have access to the information. In any publication or presentation, including the thesis that will be produced from this research, information will be provided in such a way that you and your child cannot be identified.

9. Can I access research information kept about me?

In accordance with relevant Australian privacy and other relevant laws, you have the right to access the information collected and stored by the researcher about you and your child. Please contact one of the researcher named at the end of this document if you would like to access your information.

In addition, in accordance with regulatory guidelines, the information collected in this research project will be kept for at least five years.

10. Is this research project approved?

The ethical aspects of this research project have been approved by the Human Research Ethics Committee of Southern Health and Monash University as well as by the Victorian Department of Education and Early Childhood Development.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)* produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

11. Who can I contact?

The person you may need to contact will depend on the nature of your query. Therefore, please note the following:

For further information or appointments:

If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project (for example, feelings of distress), you can contact the principal researcher on [redacted] or any of the following people:

Name: Melissa Mulraney

Role: Associate researcher

Telephone: [redacted]

For complaints:

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about being a research participant in general, then you may contact:

Name: Ms. Majar Thiagarajan

Position: **Director Research Services**

Telephone: [redacted]

12. Consent

I have read or have had this document read to me in a language I understand, and I understand the purposes, procedures and risks of this research project as described within it.

I have had an opportunity to ask questions and I am satisfied with the answers I have received. I give my permission for _____to participate in this research project according to the conditions outlined in this document.

Participant's name (printed) ……

Name of person giving consent (printed) ……

Relationship to participant: ……

Signature Date

Please provide a contact number below.

Phone number:_____

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's name (printed) ……

Signature Date

Note: All parties signing the consent section must date their own signature.

13. Assent (to be completed by participants under the age of 18)

I have discussed this project with my parent or guardian and I understand the purposes, procedures and risks of this project as described in this document.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project, as described.

Participant's name (printed) ……

Signature Date

Participant Information and Consent Form Student Participants

Full Project Title: Irritability in adolescents: Prevalence and clinical correlates.

Principal Researcher: Dr. Glenn Melvin

Associate Researchers: Professor Bruce Tonge

Ms. Melissa Mulraney

Dr. Michael Gordon

1. Introduction

You are invited to take part in this research project. This is because you are aged 11-19 years. The research project aims to find out more about irritability; how it is changed by levels of depressive symptoms (feeling sad), anxiety (feeling worried), and behavioural problems and how it differs between healthy adolescents and those who have a mental health problem. The project also aims to investigate what types of situations trigger irritability in adolescents, and whether there are differences between parent perspectives and adolescent perspectives regarding those triggers.

This Participant Information and Consent Form tells you about the research project. It explains what is involved to help you decide if you want to take part.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or your local health worker. Participation in this research is voluntary. If you don't wish to take part, you don't have to.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read;
- Consent to take part in the research project;
- Consent to be involved in the procedures described;
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

2. What is the purpose of this research project?

This project aims to extend knowledge about irritability and how it differs between healthy adolescents and those with a mental health problem. High levels of irritability in adolescence can increase risk for mental health problems. Through this research we hope to identify at what level the risk increases, which will inform future research and development of interventions. We also hope to identify how irritability differs between various mental disorders, which will inform treatment. Finally, we also hope to identify what types of situations trigger irritability in adolescents as we believe that such information will serve to inform the prevention and treatment of adolescent irritability as well as its associated mental health problems. The results of this research will be used by

the researchers Melissa Mulraney to obtain a PhD and Romy Briner as part of the requirements of her Bachelor of Arts (Psychology Honours) degree.

3. What does participation in this research project involve?

- **Procedures**

The study involves filling out a booklet of questions, which will be given to you during class time. In the booklet are five surveys, with each one asking questions about your behaviours, levels of depression, anxiety, irritability, and situations that may trigger irritability. Answering the questions in this booklet will take about 20 minutes.

We would also like to ask a parent or guardian some questions about your irritability and behaviours. If you agree to this please provide contact details on the attached consent form.

- **Reimbursement**

You will not be paid for your participation in this research.

4. What are the possible benefits?

Taking part in this study will not be of direct help to you. However, it will help us to find out more about irritability, and how it is linked to depression, anxiety, the way we express our emotions, and the way we behave. The findings of the research can help others to develop programs that plan to deal with mood and emotions, especially in teenagers.

5. What are the possible risks?

Some of the questions in the booklet may ask you to think about the emotions you experienced in the past and the emotions you experience today. These questions may also ask you about your life. This may make you feel uncomfortable or upset. If you need, the school nurse or counsellor will be available for you to talk to during and after doing the questions in the booklet.

The booklet of questions may suggest that you are at risk of developing a depressive or anxiety or behavioural disorder, which you would not have known about had you not taken part in the study.

If you are found to be ‘at risk’ then your parent or guardian will be told of this and provided with a list of counselling services, should you and/or your parent decide to talk to someone.

6. Do I have to take part in this research project?

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at a later stage. If you decide to withdraw, please notify a member of the research team. Your decision whether to take part or not, or to take part and then withdraw, will not affect your relationship with the researchers or the school.

7. How will I be informed of the final results of this research project?

A plain English summary of results will be made available to participants upon completion of the study.

8. What will happen to information about me?

When everybody's answers are put into the report, no one will be able to know which answers belong to you. Monash University needs all the data collected to be stored in a locked cupboard for 7 years. A report of the study may be given in for publication. People who took part in the study though, will not be able to be identified or recognised from this report. Your results from this study may be used in future research exploring similar signs and behaviours; however, as personal information will be destroyed before this happens, no one will be able to identify your results.

9. Can I access research information kept about me?

In accordance with relevant Australian privacy and other relevant laws, you have the right to access the information collected and stored by the researcher about you. Please contact one of the researcher named at the end of this document if you would like to access your information.

In addition, in accordance with regulatory guidelines, the information collected in this research project will be kept for at least five years.

10. Is this research project approved?

The ethical aspects of this research project have been approved by the Human Research Ethics Committee of Southern Health and Monash University as well as by the Victorian Department of Education and Early Childhood Development.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)* produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

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For further information or appointments:

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Name: Melissa Mulraney

Role: Associate researcher

Telephone: [redacted]

For complaints:

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about being a research participant in general, then you may contact:

Name: Ms. Majar Thiagarajan

Position: **Director Research Services**

Telephone: [redacted]

12. Consent

I have read, or have had this document read to me in a language that I understand, and I understand the purposes, procedures and risks of this research project as described within it.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project, as described.

I understand that I will be given a signed copy of this document to keep.

Participant's name (printed) ……

Signature Date

Please provide contact details for a parent/guardian below.

Name ……

Relationship to participant: ……

Phone number ……

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's name (printed) ……

Signature Date

Note: All parties signing the consent section must date their own signature.