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Focus on methodology

The Cranky Thermometers: Visual analogue scales measuring irritability in youth

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ABSTRACT

This study assessed the psychometric properties of two visual analogue scales of irritability, known as the Cranky Thermometers (CT), in both an Australian community secondary-school sample (N = 164) and a sample of adolescents with a depressive disorder (N = 127). The first scale Cranky Now measures current irritability, and the second, Cranky Two Weeks, measures peak irritability within the last two weeks. CT scores were significantly higher in adolescents with major depressive disorder than in the school sample and showed improvement following treatment for depression. Positive associations were found between CT and irritability scores as determined by Kiddie Schedule for Affective Disorders and Schizophrenia (not irritable, sub-threshold, threshold irritability) and Affective Reactivity Index scores. Results suggest that the CTs are rapidly administered, have promising psychometric properties and demonstrate utility in measuring irritability in clinical and community settings.

Irritable mood is defined in the DSM-5 as “easily annoyed and provoked to anger” (p 825; [American Psychiatric Association, 2013](#)), and while it is under-researched, epidemiological studies suggest that irritability is commonly reported in adolescence. [Sund, Larsson, and Wichstrøm \(2001\)](#) found that 44% of 13–14 year olds (N = 2560) reported feeling irritable for some of the past two weeks (as measured by a Moods and Feelings Questionnaire item about grumpiness and being cross with parents), with a further 12% reporting feeling irritable for most of the past two weeks. Mixed findings exist about the relationship between irritability and age and gender, with some longitudinal findings suggesting higher levels of both chronic and episodic irritability in females than males ([Leibenluft, Cohen, Gorrindo, Brook, & Pine, 2006](#)) and others finding no gender differences in chronic irritability ([Holtzman, O'Connor, Barata, & Stewart, 2015](#); [Stringaris et al., 2012](#)). Reductions in adolescent irritability with age, that could be interpreted to reflect changes in social competence and self-regulation development, have not been found consistently in the literature (e.g., no change with age, [Stringaris et al., 2012](#); reductions with age for males but not females, [Caprara, Paciello, Gerbino, & Cugini, 2007](#)). Reduction in severe mood dysregulation, a syndrome characterised by chronic elevated irritability, has been found with age ([Deveney et al., 2015](#)).

Irritable mood is present in the diagnostic criteria of a number of psychiatric disorders, both internalising and externalising, including pediatric depressive disorder, generalized anxiety disorder, post-traumatic stress disorder, oppositional defiant disorder

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and is listed as an associated feature of attention-deficit/hyperactivity disorder (ADHD) (American Psychiatric Association, 2013). Irritability has also featured in the much debated, pediatric bipolar disorder, where the presence of chronic irritability has been interpreted by some as an early feature of mania (Biederman, Klein, Pine, & Klein, 1998). By including children exhibiting chronic irritability in the absence of other cardinal manic symptoms, diagnosis of this condition increased considerably, estimated by some up by 500% (Moreno, Laje, & Blanco, 2007). So great were the concerns about the possible over-diagnosis of pediatric bipolar disorder and over-prescription of antipsychotics among youth (Domino & Swartz, 2008), that DSM-5 (American Psychiatric Association, 2013) added a new diagnosis, disruptive mood dysregulation disorder (DMDD), to capture those children presenting with persistent irritability and frequent temper outbursts.

Given the broad experience of irritability across internalising and externalising disorders, and in the normal population, there is a need for further understanding of the phenomenology of irritability. Children and adolescents with psychiatric disorders experience higher levels of irritability than community samples (Mulraney, Melvin, & Tonge, 2014; Stringaris et al., 2012), and there is preliminary evidence to suggest the experience of irritability may differ according to diagnosis (Mick, Spencer, Wozniak, & Biederman, 2005) and between clinical and community samples (Carlson, Danzig, Dougherty, Bufferd, & Klein, 2016). In addition, irritability during adolescence predicts emotional disorders (anxiety and depression) in later adolescence (Leibenluft et al., 2006), and in adulthood (Copeland, Shanahan, Egger, Angold, & Costello, 2014; Stringaris, Cohen, Pine, & Leibenluft, 2009); suicidality in adulthood (Pickles et al., 2010); poor health and educational outcomes, and contact with the justice system in adulthood (Copeland et al., 2014).

There is a lack of instruments dedicated to measuring irritability in adolescents which has been recently highlighted as a key limitation of the field (Vidal-Ribas, Brotman, Valdivieso, Leibenluft, & Stringaris, 2016). Many studies on irritability rely upon one or two items extracted from a questionnaire measuring another construct (e.g., Reynolds Adolescent Depression Scale-2, Children's Depression Rating Scale Revised, Moods and Feelings Questionnaire, Achenbach's Child Behavior Checklist). While numerous measures have been developed to measure irritability in adulthood (e.g., The Buss Durkhee Hostility Inventory, The Irritability, Depression, Anxiety Scale, The Born-Steiner Irritability Scale, The Brief Irritability Test), and young children (The Multidimensional Assessment of Preschool Behavior; Wakschlag, Tolan, & Leventhal, 2010), few have been validated for use with adolescents. The Aberrant Behavior Checklist (ABC) contains an irritability subscale which has been used as an outcome measure in randomized controlled trials (e.g., Arnold et al., 2010; Curran, 2011). However, the ABC was developed for use with intellectually disabled children and the irritability subscale includes items about self-harm and depressed mood, and thus may not reflect the DSM-5 definition of irritable mood. Moreover, the development of new measures may aid in the detection and rating of treatment outcome of diagnoses that feature irritability. Inter-rater reliability of DMDD in DSM-5 field trials was acceptable in inpatient settings but unacceptable in outpatient settings, which may be improved through the use of additional reliable and valid measures. Stringaris et al. (2012) responded to this gap in the literature by developing The Affective Reactivity Index (ARI), a measure of chronic irritability over a specified time period (e.g., one week, six months) catering for youth and parent report. It comprises six items measuring threshold, frequency and duration of irritability symptoms, and one impairment item. Studies show promising psychometric properties (Mulraney, Melvin, & Tonge, 2013; Stringaris et al., 2012).

In the current study, the Cranky Thermometer (CT) visual analogue scales, were developed as a very brief measure of adolescent-reported state irritability. Visual Analogue Scales (VAS) have been found useful in the measurement of anxiety (Bernstein & Garfinkel, 1992), pain (Williamson & Hoggart, 2004), global functioning, and quality of life (de Boer et al., 2004). In addition, VAS feature within a measure of irritability related to the menstrual cycle, pregnancy and menopause (Born, Koren, Lin, & Steiner, 2008). Adolescent report was the focus of the CT, given that adolescents are arguably better reporters of their internal state than an observer. The measure was designed to assess state irritability in the current moment and the 'worst moment' within the last two weeks, in contrast to the ARI's focus on chronic irritability over a specified period of time. The CT may thus complement the ARI by measuring related but distinct aspects of irritability. This measure may be particularly useful in research settings that investigate changes in irritability state in laboratory settings, such as mood-induction experiments.

We describe here the development and psychometric evaluation of the CT in two adolescent samples, a secondary school sample and clinically-referred adolescents who received treatment for a unipolar depressive disorder (Melvin et al., 2006). In addition to reporting descriptive statistics, test-retest reliability and investigating CT score relationship with age and gender we made multiple hypotheses regarding the validity of the measure. First, we predicted a gradation in irritability scores, with the lowest scores in the school sample, followed by those with Depression Not Otherwise Specified or Dysthymic Disorder and highest scores in those with Major Depressive Disorder. Similarly, we expected a decrease in irritability scores over treatment in the clinical sample. CT scores were expected to correlate positively with ARI scores in the school sample, and positively with irritability ratings on the Kiddie Schedule for Affective Disorders & Schizophrenia in the clinical sample, demonstrating good criterion validity. As irritability is a symptom of adolescent depression, we also expected CT scores to demonstrate a positive correlation with depressive symptoms as measured by the Reynolds Adolescent Depression Scale. Similarly, as irritability has been associated with externalising conditions, we expect positive correlations between CT and attention/hyperactivity, conduct and emotional subscales of the Strengths and Difficulties Questionnaire.

1. Methods

1.1. Sample and procedures

Projects received approval from Monash Health (Project 99014B and 10349A) Human Research Ethics Committee. Use of the school sample also received approval from the Victorian Department of Education and Training (Project 2011_000990) and school principals (Victoria and Tasmania).

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