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Research paper

Irritability and internalizing symptoms: Modeling the mediating role of emotion regulation

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ABSTRACT

Background: Irritability and emotion regulation are both important transdiagnostic factors that contribute to the development of internalizing symptoms during adolescence. The current study examined whether emotion regulation mediates the relationship between irritability and internalizing symptoms.
Methods: To examine this relationship we analysed the indirect effect of irritability (measured using a single item from the Goldberg Mania Questionnaire) on internalizing symptoms (anxiety and depression) via the mediator, emotion regulation (Difficulties in Emotion Regulation Scale) in 112 adolescent females.
Results: Mediation analysis, using bootstrapping, showed a significant indirect effect and suggests that the relationship between irritability and internalizing symptoms is mediated by emotion dysregulation.
Limitations: These include measuring irritability using a single item and employing a cross sectional design.
Conclusions: These novel findings add to our understanding of the processes and mechanisms by which irritability contributes to the development of internalizing symptoms.

1. Introduction

Anxiety and depressive disorders are among the most commonly occurring mental health disorders in adolescence with prevalence rates of approximately 30% and 14% respectively. Typically, anxiety disorders appear in the first decade of life- as early as 6 years of age whereas depressive disorders usually first manifest in the second decade of life: around 13 years of age. Rates of both sets of disorders steadily increase throughout adolescence into adulthood (Merikangas et al., 2010). Notably, there is a significant degree of overlap between these disorders with depression and anxiety often co-occurring either simultaneously or as a precursor to one another during adolescence (Brady and Kendall, 1992; Cummings et al., 2014; Garber and Weersing, 2010; Jacques and Mash, 2004; Malhi et al., 2002). Anxiety and depressive disorders are collectively described as internalizing disorders, and adolescence is a critical period for the development of internalizing symptoms. This is because the transition from childhood to adolescence involves enormous biological change, particularly in terms of neurocognitive and emotional development.

1.1. Irritability

Many factors may account for the emergence of internalizing symptoms during this developmental period. Amongst these, irritability is a trait that has been repeatedly implicated (Vidal-Ribas et al., 2016). Irritability is also a symptom that commonly occurs during childhood, so much so that chronic persistent irritability, beginning prior to 10 years of age, now forms the core feature of a new disorder recently introduced into DSM-5 (Diagnostic and Statistical Manual of Mental Disorders 5th edition) namely, Disruptive Mood Dysregulation Disorder (DMDD). In practice, irritability also features in many other disorders, such as Conduct Disorder, Attention Deficit Hyperactivity Disorder, Oppositional Defiant Disorder, Major Depressive Disorder, and Generalized Anxiety Disorder and therefore approximately 28–51% of children (aged 9–16 years) report experiencing symptoms associated with irritability (Copeland et al., 2015).

Conceptually, irritability was initially thought to be a symptom that arises as a result of psychopathology, but recent research suggests that it is perhaps a transdiagnostic factor that instead contributes to the development of psychopathology. Specifically, recent research points to a contributory link between irritability and emotional symptoms during late childhood/early adolescence (Savage et al., 2015), as opposed to

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the converse possibility that, i.e., emotional symptoms eventuate in irritability. However, the mechanisms by which irritability impacts emotion processes and culminates in internalizing psychopathology are unknown. In fact, to date there have been no studies investigating the potential processes and mechanisms involved in linking irritability and internalizing psychopathology.

Research examining ongoing neurobiological development during adolescence suggests that systems involved in cognitive control and emotion processing mature differentially (Mendle, 2014). These changes, coupled with the psychosocial stresses associated with puberty, and adolescence more generally (e.g., shifting importance on peer relationships, process of individuation), provide a fertile environment for the development of internalizing symptoms, such as anxiety and depression. Importantly, during adolescence adaptive emotion regulation is critical to manage the stress associated with the many biological and interpersonal changes that typify this developmental period.

1.2. Emotion regulation

Emotion regulation is defined as *"the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals"* (Thompson, 1994, pg. 27–28) and research has shown that maladaptive emotion regulation strategies are consistently associated with internalizing disorders (Aldao et al., 2010). Interestingly, middle adolescence (the time when internalizing symptoms are most likely to emerge) is also the period when individuals have the smallest total repertoire of emotion regulation strategies at their disposal (Lougheed and Hollenstein, 2012). Therefore it seems that adolescence is inherently a critical period of development during which emotion regulation is cultivated and refined, and aberrations in these processes may result in clinical anxiety and depression.

Thus, given that both emotion dysregulation and irritability are key contributing factors in the development of internalizing disorders that feature prominently during adolescence, we posited that these transdiagnostic factors work iteratively and in unison such that they culminate in internalizing symptoms. Furthermore, because irritability can emerge in childhood and is known to be driven by genetic factors, it is likely that it precedes the development of emotion dysregulation. In addition it is possible that irritability produces internalizing symptoms via its effects on emotion dysregulation. Therefore in the current study we investigated the nature and extent of the relationship between these key variables, specifically whether *emotion dysregulation* mediates the relationship between *irritability* and *internalizing symptoms*.

2. Method

2.1. Participants

A total sample of 112 adolescent females aged between 14.42 and 16.75 (*M*=15.27, *SD*=.54) were recruited from a local school. Female adolescents were chosen because from about the age of 13 years onwards, females tend to experience higher rates of internalizing symptoms compared to males (Galambos et al., 2004; Hankin et al., 1998; Nivard et al., 2016), a discrepancy that is not typically observed during childhood. This suggests that adolescence, particularly aligning with the onset of puberty, is a crucial developmental period whereby females are at greater risk of developing internalizing symptoms (Mendle, 2014).

2.2. Measures

This study was conducted as part of a larger ongoing longitudinal research study, therefore, only the relevant measures for this study will be presented and as a result the following analyses were conducted post hoc.

2.3. Depression

The Children's Depression Inventory (CDI; Kovacs, 1992) was used to measure depressive symptoms. This self-report measure comprises 27 items related to symptoms of depression or dysthymia. Participants select one of three statements that best represents themselves (e.g., "I am sad once in a while"; "I am sad many times"; "I am sad all the time") within the last two weeks. Each item is rated from 0 to 2 with higher scores representing greater severity of depressive symptoms. Previous research indicates this measure has good psychometric properties (Smucker et al., 1986) and in the current study demonstrated good internal consistency (α=.89).

2.4. Anxiety

Participant levels of trait anxiety were measured using the trait scale of the State-Trait Anxiety Inventory (STAI-T; (Spielberger, et al., 1983). This measure consists of 20 items related to symptoms of trait anxiety (e.g., "I am a steady person") that participants rate from 1=not at all to 4=very much so. Previous studies indicate that the STAI-T has good psychometric properties (Crawford et al., 2011; Spielberger, et al., 1983) and in the current study demonstrated good internal consistency (α=.91).

2.5. Irritability

Irritability was measured using the "I have been irritable" item from the Goldberg Mania Questionnaire (GMQ; Goldberg, 1993), which all participants rated on a 6 point Likert scale ranging from 0=not at all to 5=very much.

2.6. Emotion regulation

The Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer, 2004) was used as a measure of dysfunctional emotion regulation. The DERS consists of 36 self-report items and 6 subscales: non-acceptance of negative emotional responses; difficulties engaging in goal-directed behaviours when distressed; difficulties controlling impulsive behaviours when distressed; limited access to emotion regulation strategies; lack of emotional clarity; lack of emotional awareness. Total scores are calculated by summing ratings, from "1=Almost never" to "5=Almost always", on all items. Research indicates that non-clinical samples generally score below 75 (Gratz and Roemer, 2004). This measure has shown excellent psychometric properties (Gratz and Roemer, 2004; Ritschel et al., 2015). In the current sample internal consistency was good (α=.93).

3. Statistical analysis

Initially, descriptive statistics and bivariate correlations between all variables were examined. Structural equation modeling was used to test the measurement model and the mediation model following procedures established by Schumacker and Lomax, (2010). The mediation model as well as model fit was examined with IBM SPSS AMOS Version 22 (using 2000 bootstrap samples to estimate the mediation model). Regarding model fit, goodness of fit was assessed using the following indices: $\chi 2$ and degrees of freedom ratio (< 2.00 indicating acceptable fit); Confirmatory Fit Index (CFI) (> .90 indicating acceptable fit); and Root Mean Square Error of Approximation (RMSEA) (> .1 indicative of poor fit, < .08 acceptable fit, < .05 close fit) (Hu and Bentler, 1999). The mediation model examined whether dysfunctional emotion regulation mediated the relationship between irritability and internalizing symptoms. This model contained two latent variables; the outcome variable, internalizing symptoms (defined by anxiety and depressive symptom scores on the STAI-T and CDI, respectively); and the mediator, dysfunctional emotion regulation