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Research paper

Do better executive functions buffer the effect of current parental depression on adolescent depressive symptoms?

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ABSTRACT

Background: Offspring of parents with a history of major depressive disorder (MDD) and especially those exposed to a current episode of parental depression have been found to be at increased risk for developing depression themselves. Exposure to a current parental depressive episode also reduces the efficacy of interventions in high risk or depressed adolescents. This highlights the need to identify protective factors for adolescents exposed to a current parental depressive episode. Executive functions serve as an important cognitive resource, involved in the ability to regulate mood and thoughts and cope with stressful events. This study examined the buffering role of two components of executive functioning, inhibitory control and mental flexibility, in the association between a current parental episode of MDD and adolescent depressive symptoms.

Methods: A high-risk sample of 288 adolescent offspring of parents with recurrent major depressive disorder completed an Affective Go/No Go and a Verbal Fluency task. Parents and adolescents underwent psychiatric interviews.

Results: In the presence of a current parental depressive episode in the parent, adolescents with better inhibitory control and mental flexibility had fewer depressive symptoms after controlling for age, gender and IQ.

Limitations: Participants were the offspring of depressed parents and it is not clear whether the protective effects of executive functioning observed here would generalise to other populations.

Conclusions: Executive functions may protect against adolescent depression in the presence of a parental depressive episode. It may be beneficial to target executive functions in preventive programs for individuals at high-risk for depression.

1. Introduction

Parental depression has been identified as a major risk factor for depression in childhood and adolescence with children of depressed parents three to four times more likely to develop depression than offspring of non-depressed parents (Garber, 2006; Rice and Rawal, 2010; Weissman et al., 1997). Despite the strong association found between parental depression and offspring depression, there is heterogeneity in outcomes for children of depressed parents which is partly attributable to clinical features of parental depression. Evidence suggests that exposure to a current parental depressive episode is an important feature of parental depression that increases risk for offspring. For instance, children of parents with a history of recurrent depression whose parents have had a recent episode of major depressive disorder (MDD) show elevated rates of psychiatric disorder and depressive symptoms (Mars et al., 2012). Exposure to a recent episode of depressive disorder in a parent has also been shown to moderate the efficacy of treatment and prevention programs (Beardslee et al., 2013; Brent et al., 1998; Garber et al., 2009). Thus, exposure to a current parental episode may serve as a particularly salient risk factor among those at familial risk of depression. This evidence, taken together with the long-term adverse consequences of depression in childhood and adolescence (Dunn and Goodyer, 2006; Fergusson et al., 2007; Rice

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et al., 2007; Rutter et al., 2006) emphasizes the need to identify protective factors for high-risk offspring and especially for those currently exposed to a depressive episode in the parent.

Several lines of evidence suggest that executive functions may confer protection against depression for the adolescent offspring of depressed parents. First, cognitive models of depression suggest that the mood regulation difficulties that characterise currently depressed individuals (De Lissnyder et al., 2010; Harmer et al., 2009; Roiser et al., 2011) may arise from difficulties with executive functions such as inhibition and mental flexibility. Inhibitory control involves controlling attention, thoughts and behaviours in order to override an automatic or dominant response and mental flexibility allows switching between different mental sets or perspectives in order to adjust to changing or novel circumstances (Davidson et al., 2006; Diamond, 2013; Miyake et al., 2000). It is plausible that the ability to inhibit thoughts and flexibly switch between thoughts and perspectives can protect against being "captured" by negative thoughts or low mood. Thus, both inhibitory control and mental flexibility have been associated with more effective emotional regulation strategies including lower levels of rumination – a cognitive style which perpetuates negative affect (Gotlib and Joormann, 2010; Joormann and Quinn, 2014) and higher levels of reappraisal – an effective mood repair strategy (McRae et al., 2012; Ochsner and Gross, 2008). Studies conducted with depressed adults have indicated particular impairments in inhibitory control and mental flexibility when processing emotional information (Deveney and Deldin, 2006; Gotlib and Joormann, 2010; Murphy et al., 2012). Although fewer studies have examined if these impairments occur in depressed children and adolescents, several lines of evidence suggest these deficits are also present in depressed children and adolescents (Kyte et al., 2005; Ladouceur et al., 2005; Wagner et al., 2014). Moreover, preliminary evidence suggests that difficulties in executive functioning, such as impairments in inhibition on emotional tasks, may precede and increase risk for depression (Joormann et al., 2007; Kilford et al., 2014).

A second line of evidence that suggests executive functioning may protect against depression is that efficacious interventions for treating and preventing adolescent depression such as Cognitive Behavioural Therapy (CBT) (Stice et al., 2009; Weisz et al., 2006) involve training in evaluating and challenging thoughts and introducing alternatives (Forkmann et al., 2014; Friedberg and McClure, 2002). These mood regulation skills involve elements of executive functioning, for instance in inhibiting negative thoughts (i.e. inhibition) and thinking about an issue from a different perspective to introduce alternative thoughts (i.e. mental flexibility). In a similar way, when healthy individuals are instructed to look at an emotionally salient event from different perspectives this has significant impact on emotional regulation and reactivity as measured by self-report and physiological measures (Kross et al., 2005; Schartau et al., 2009; Southwick et al., 2005).

A third source of evidence comes from findings which suggest that executive functions may serve as an important cognitive resource that protects individuals at familial risk of psychiatric disorders (Johnson, 2012). Johnson (2012) suggests that better executive functions may help those at genetic risk for developmental disorders by allowing compensatory brain systems to be recruited during cognitive operations. Thus, it is plausible that executive functions may also serve as a protective factor in those at increased familial risk of depression.

Although previous research has shown that currently depressed individuals are characterized by executive functioning impairments and that these impairments may increase risk for depression, past studies have not directly examined whether better executive functions serve as a protective factor for those at increased familial risk of depression. In order to address this gap in the literature, we aimed to examine the protective effect of executive functioning (inhibitory control and mental flexibility) in a high risk sample of adolescent offspring of parents with a history of recurrent MDD. Our primary research question was whether inhibitory control and mental flexibility protected against the predicted risk effect of a current parental depressive episode on adolescent depressive symptoms. On the basis of evidence involving inhibitory control and mental flexibility with dysregulation of thoughts and emotions we also examined whether the proposed moderating effect of executive functions was present for both cognitive-emotional depressive symptoms (e.g. low mood/irritability and concentration difficulties) and for vegetative-somatic depressive symptoms (e.g. change in appetite or weight and psychomotor retardation/agitation). We hypothesized that for adolescents exposed to a current parental episode, the buffering effect of executive functions would be more consistently present for cognitive-emotional depressive symptoms than for vegetative-somatic depressive symptoms given that the former indicate dysregulation of thoughts and emotion and therefore might be more attenuated in those with better executive functions.

2. Methods

2.1. Participants

Participants were a part of a longitudinal study of parents with recurrent major depression and their adolescent offspring (aged 9-17), the Early Prediction of Adolescent Depression (EPAD) study. Parents were recruited from general practices in south Wales (78%), from a previous community study of recurrent unipolar depression (19%) and from advertisements in primary care health centres (3%). Following initial screening over the phone, parents underwent a psychiatric interview to confirm a history of recurrent unipolar depression. Families were excluded if the index parent met criteria for a bipolar disorder, mania/hypomania or psychotic disorder at the time of the interview; the child wasn't living at home or had an IQ lower than 50. If more than one child in the household was eligible to participate in the study, the youngest child was selected in order to prevent selection bias. The EPAD study was undertaken with approval of the Multi- Centre Research Ethics Committee for Wales. Assessments were administered in families' homes. The present study utilizes data collected at the second assessment of the study because adolescents completed a battery of cognitive tests including measures of executive functioning at this assessment.

At the second assessment of the study 288 parents and 275 adolescents completed research psychiatric interviews, the Child and Adolescent Psychiatric Assessment (CAPA), for assessing psychopathology in the offspring. Among 288 adolescents for whom a psychopathology assessment was completed (by either the parent and offspring or by the parent only), data on performance on the Verbal Fluency (VF) task was available for 264 (91.6%) adolescents and data on performance on the Affective Go/No-Go Task (AGN) was available for 187 (64.9%). Fig. S1 outlines participation rates and reasons for non-completion. There were no systematic differences between adolescents who completed the Verbal Fluency task and the AGN and those who did not in terms of gender [VF: $\chi^2(1)=1.52, p=.22$; AGN: $\chi^2(1)=.10, p=.75$], age [VF: $t(286)=1.40$, $p=.16$; AGN: $t(286)=.89$, $p=.37$] and depressive symptoms [VF: $t(282)=.96$, $p=.34$; AGN: $t(282)=-.07$, $p=.95$]. However, participants who completed the VF and AGN had higher IQ scores than those who did not [VF: $t(328)=-4.54$, $p<.001$; AGN: $t(328)=-2.83$, $p<.01$]. IQ was therefore included as a covariate in all analyses that follow. As detailed in Table 1, the mean number of CAPA defined adolescent depressive symptoms was 1.93. Additionally,