RESEARCH ARTICLE

Stress load, stress coping and activity of HPA axis in adolescents with major depression

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Based on former empirical studies and theoretical considerations the present study investigated differences in stress load and stress coping between adolescent girls with major depression and controls. In addition, a biological indicator of chronic stress (the cortisol awakening response) was measured. 148 girls with a mean age of 15 years were studied. 74 fulfilled DSM IV criteria for major depression. Stress symptoms and stress coping was measured with SSKJ 3-8 and SVFKJ which are validated German questionnaires. Depressed girls reported a significantly higher stress load and significantly more destructive stress coping. The results are interpreted with respect to a stress-related psychobiological model of depression in youth.

Key Words: *Depression; Stress; Stress coping; Adolescents; Cortisol*

INTRODUCTION

Depression in children and adolescents is frequent. Data from Germany show a lifetime prevalence of 17.9%.Wartberg found in a representative sample of German adolescents that 68.4% of the interviewed participants reported depressive symptoms. Girls more often suffer from a diagnosed depression than boys. In general, the risk for a psychiatric disorder in adolescents is heightened for children in families with a low SES. The social interaction within families, in particular, a lack of positive social support by parents increases the risk to develop depression or to maintain depressive symptoms significantly Séguin: This is also true, when a high degree of maternal psychopathology is present [1-6].

The significance of stress for the development and maintenance of depression in adolescents

Stress can be conceptualized as an aversive stimulus from the environment that the person tries to avoid or to reject as soon as possible. This aversive stimulus may also have its origin from cognitions or bodily perceptions inside the person. High stress vulnerability means that the person is extraordinarily sensitive to the perception of aversive stimuli inside or outside the person. Coping can be defined as conscious volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstances. A controlled study from Krackow and Rudolph showed that psychosocial stressors such as conflict with peers reinforce a depressive disorder and more frequently are present as a consequence of depression. This has been confirmed by a longitudinal investigation of Cole. Stressors were significant predictors of the severity of depression, independent from age or sex of the participants. In accordance with these findings are Wartberg that depicted especially psychosocial stressors in the natural environment of depressed girls and boys [2,7-9].

Stress coping in depressed adolescents

A sarnow investigated reactions of children with a diagnosis of depression to a coping strategies test. The depressed children were not able to present constructive, problem oriented solutions. Inadequate stress coping reinforced depression significantly in a large sample of adolescents with chronic headache Compas. Stange conducted a longitudinal investigation with a time interval of nine months which presents a significant relationship between coping strategies such as rumination or resignation and the maintenance of a diagnosed depression. The relationship is further supported by Connolly and Alloy with results from daily environment of depressed youth [10-12].

Stress-related cortisol levels in depressed adolescents

Morris conducted an experimental study with young MDD patients compared to controls. The anticipatory cortisol response to the TSST (Trier Social Stress Test) was significantly higher in depressed patients and was also significantly correlated to the severity of the depressive symptoms. Booij found that the cortisol response to a psychosocial stressor was positively correlated to the duration of depressive symptoms in adolescents. In their discussion they mentioned a study of adult depressed patients with several prior depressive episodes, but did not offer a stringent explanation for their own results in adolescents. Lopez-Duran presented results on different aspects of the HPA axis. A main goal was to analyze the response to psychosocial stress in youth depression and to determine age and sex effects. Results suggest that depression symptoms are associated with a more prolonged activation of the axis and impaired recovery to psychosocial stressors primarily in boys. Based on former empirical studies the present investigation hypothesized differences in stress load and stress coping between depressed adolescents and controls. To expand prior research differences in HPA axis functioning are reported and linked to stress load and stress coping in order to predict severity of depression [13,14].

METHODOLOGY

All Patients were recruited from the Department of child and adolescent psychiatry in a general hospital in Trier. At time of the study they were inpatients and cortisol samples and questionnaires were collected in hospital. All patients fulfilled DSM IV criteria for major depression which was proved by a structured clinical interview Kinder DIPS Diagnostic interview schedule for children and adolescents. The assessment was done by a child psychiatrist. The interview asks for symptoms and conditions, which are necessary to make a diagnosis for a psychiatric disorder in adolescents according to DSM IV. It comprises a screening, a specific part, for further clarification, if a disorder is supposed, and collection of patient and family history [15].

A control group was recruited by advertisements in the local newspaper. These girls were also invited to be interviewed in hospital by the child

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psychiatrist, to exclude clinically significant psychiatric disorders. The study was approved by the ethical committee of the University of Trier (17.2.2010). All participants and their parents gave written informed consent for the study. Funding of the study was provided by grant LA 681 25 1 from the German research foundation. The money was limited and did not allow investigating a larger sample, so depressed girls were investigated first, also because the relevance of depression in young girls seemed to be greater.

All participants were payed for participation

Patients and controls were assessed twice with a time interval of 6 months between the two measurement points in Tables 1-4.

TABLE 1

Description of the sample

	Major depression (n=74)	Controls (n=74)
Age (years)	15.7 ± 2.1	15.1 ± 2.4
High school (%)	66	81
Parents academic education %	4	10

There were no significant differences between patients and controls with respect to these characteristics.

Questionnaires

The severity of depression was assessed by the Depression Inventory for children and adolescents (DIKJ) [16].

Coping strategies

Reactions to stressful situations were obtained by the coping questionnaire for children and adolescents (SVF-KJ). The questionnaire measures reactions to stress, when a stress situation is described. It comprises strategies which reduce stress as well as strategies that enhance stress. 9 subscales are provided [17].

Stress load

Stress load was assessed by the questionnaire for stress and stress coping for children and adolescents (SSKJ) [18]. The subscales comprise 1.vulnerability to stress, 2.physical symptoms of stress such as headache, stomach ache or exhaustion 3. Psychological symptoms of stress such as depressed mood and anxiety. All participants collected saliva samples after awakening to determine cortisol. For patients this was done in hospital. The controls collected these samples at home. They were together with their parents in detail instructed how to collect and store the saliva until transport to the biochemical laboratory.

RESULTS

The depressed girls had a mean value of 19.3 ± 7.5, the controls of 9.7 ± 6.4 on the Depression Scale. As expected the mean for the depressed girls was significantly higher and indicates clinically significant depression according to norm-tables for this questionnaire.

TABLE 2

Depicts mean values for stress load in patients and controls

Scale of SSKJ	Controls	Major depression
Stress vulnerability	15.5 ± 3.0	17.7 ± 2.8
Physical stress symptoms	10.1 ± 2.7	11.8 ± 3.0
Psychol. stress symptoms	21.9 ± 5.5	27.6 ± 5.1

The statistical analysis for comparison between depressed patients and controls with MANOVA for all three scales simultaneously was significant with F (3,144)=16.2, p<.001. The depressed girls had significantly higher mean values on all three scales. They felt more stress load physically as well as psychologically and were more vulnerable to the perception of stress situations.

TABLE 3

Depicts mean values for stress coping strategies in patients and controls

Scales of SVFKJ	Controls	Major depression
Down playing	17.2 ± 5.4	14.9 ± 5.4
Distraction	11.2 ± 5.5	9.6 ± 5.0
Control of stress	23.2 ± 4.3	19.9 ± 5.9
Positive self-instruction	22.5 ± 5.0	18.0 ± 6.7
Social support	20.4 ± 4.9	18.1 ± 5.9
Passive avoidance	13.8 ± 6.3	19.0 ± 7.1
Rumination	17.9 ± 6.1	21.5 ± 7.0
Resignation	8.5 ± 5.8	13.7 ± 7.5
Aggression	11.7 ± 6.4	15.6 ± 6.9

Stress coping for girls with major depression and controls (M ± SD).

The comparison of the means with a MANOVA for all 9 scales simultaneously yields F (9, 138)=4.4, p<.001.

The coping strategies of the girls with depression were significantly more inadequate than those of the controls. They avoid stress situations passively. If a stress situation has been occurred, they ruminate extensively. Resignation and aggression are also possible, whereas a lack of constructive reactions such as the search for social support can be observed.

TABLE 4

Depicts mean cortisol after awakening for the comparison groups (Mean± SD) in nmol/ml

Time of cortisol sample	Controls	Major depression
Awakening	7,2 ± 3,8	6,7 ± 3,5
+30 minutes	10,4 ± 3,9	10,8 ± 4,4
+45 minutes	9,9 ± 3,9	11,3 ± 4,2
+60 minutes	8,9 ± 4,0	10,7 ± 4,3

Mean cortisol over time was analyzed by MANOVA for repeated measurement. A significant interaction effect between cortisol after awakening (4 measurements) and comparison group was found, F (3,132)=3.01, p<.04. Excluding awakening all means were higher for girls with major depression.

Stress load, stress coping and cortisol levels 60 minutes after awakening at time I (when depression was diagnosed) were used in a linear multiple regression analysis to predict severity of depression six months later. Stress load was represented through physical and psychological stress symptoms measured by the scales of the SSKJ, stress coping was represented by passive avoidance and rumination, because these Scales have shown the largest mean differences between patients and controls.

The regression equation with these variables was significant with F (5,136)=15.4 p<.001-and an explained variance of 35%. Passive avoidance,

psychological stress symptoms, and cortisol awakening response had significant regression coefficients on a two tailed significance level of .05.

DISCUSSION

The present study confirmed former results in adolescent girls with major depression. Psychologically these girls suffer from a higher stress load physically as well as psychologically. Their coping strategies are mostly inadequate focusing on passive avoidance, rumination, resignation, whereas constructive attempts to cope with stress situations, such as problem solving, positive self-instructions or the search for social support are lacking.

On a biological level, the cortisol awakening response, when taken as an indicator for chronic stress, was significantly higher in the depressed adolescents.

Further studies are in accordance with our results

In a study with standardized daily diaries in 15 years old depressed girls higher stress vulnerability was a significant predictor for the maintenance of depression over time. A significant relationship of the degree of depression to destructive stress coping was reported by Horwitz. School stress in particular was highly significant correlated with depression [19-21].

The results of this study for adolescents can be integrated into the cognitive model of Beck, which has been proposed for adult depression. A high stress load physically as well as psychologically leads to inadequate coping strategies such as passive avoidance, rumination, resignation, or aggression which prevent short term stress coping but promote the maintenance of depression in the long-term. The results of underscore our findings insofar as they indicate that perceiving greater stress than usual was associated with situational elevations in cortisol and are dependent of both situational variation and individual differences in coping [22-25].

The results from multiple linear regression analysis at least question postulates and former empirical data of investigations in the framework of response style theory of depression in adolescent, because we did not find a significant contribution of rumination in predicting severity of depression over time. Instead, passive avoidance with regard to stress situations seems to be more important. However, our sample was relatively small and therefore requires replication.

CONCLUSION

Treatment and prevention of depression in adolescents should therefore to rely on their positive resources and carefully attempt to train and maintain constructive ways to cope with stressful situations. A group based program is available and has already been evaluated

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