

## Research Article

# Classification of Depressed and Nondepressed Girls by Stress Load, Stress Coping, and Activity of HPA Axis

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**Abstract**

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. A classification in depressed and nondepressed girls was done by discriminant analysis. Stress load, stress coping, and cortisol awakening response were used as predictors. Canonical correlation coefficients were used to evaluate classification. When passive avoidance was included in the analysis, the best discriminant function could be obtained.

**Keywords:** Depression; Stress; Stress coping; Adolescents; Cortisol

**Introduction**

Depression in children and adolescents is frequent. Data from Germany show a lifetime prevalence of 17.9% [1].

A concise model for development and maintenance of depression in children and adolescents at present does not exist. Discussed are multifactorial models that take into account social factors such as low socio-economic status [2] also genetic, individual, and familial factors [3]. During the last years the investigation of stress became more and more important.

The frequency of diagnosed depression in girls is greater than in boys by factor 2 [3].

**Development and maintenance of depression in adolescents**

At present a multifactorial model is favored which takes into account social, familial, genetic, and neuroendocrine determinants for the affective disorder. In addition, the investigation of stress load and stress coping in depressed youth has been focused.

**Social factors**

The risk to develop a psychiatric disorder in general is heightened for children from families with a low socioeconomic status. This has been already shown in a large epidemiological study by [2]

Children from families with a low income had a threefold greater probability to develop a depressive disorder. This has been confirmed in a recent study by [4].

**Factors related to the families of depressed children**

The families are characterized by the lack of positive supporting interactions with parents. These may be extremely focusing on conflicts and therefore provoke anger and aggression in children. Such conditions are especially present, when a high degree of parental psychopathology could be identified [5].

**Neuroendocrine findings**

The severity of depressive symptoms is significantly correlated with cortisol levels during a laboratory stressor [6].

A long duration of depression leads to stress related hyperactivity of HPA axis [7].

A dysregulated feedback of cortisol secretion after stress is reported by [8]. Cortisol does not recover.

A lack of social support results in a hyperactivity of HPA axis. Not seeking social support then is responsible for the maintenance of depression as well as for hyperactivity of the HPA axis [9].

**The significance of stress for the depressive disorder**

A controlled study of [10] showed that psychosocial stressors reinforce the depression and are also more frequent as a consequence of depression.

This has been supported by a further study of [11] by a longitudinal analysis.

**Inadequate stress coping**

Destructive stress coping in adolescents diagnosed as depressed has been found in [12,13].

The empirical data seem to suggest that stress load and stress coping may be related to the development and maintenance of depression in adolescents.

The present study is an attempt to replicate the former results and in addition tries to identify psychological and biological predictors for a classification of the adolescents in depressed and nondepressed.

**Methods**

All Patients were recruited from the Department of child and adolescent psychiatry in a general hospital in Trier and fulfilled DSM

**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

**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

IV criteria for major depression which was proved by a structured clinical interview.

A control group was recruited by advertisements in the local newspaper.

The study was approved by the ethical committee of the University of Trier (17.2.2010).

All participants were paid for participation.

Patients and controls were assessed twice with a time interval of 6 months between the two measurement points (Table 1).

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) [14].

### Coping strategies

Reactions to stressful situations were obtained by the coping questionnaire for children and adolescents (SVF-KJ) [15]. The questionnaire measures reactions to stress, when a stress situation is imaged. It comprises strategies which reduce stress as well as strategies that enhance stress. 9 subscales are provided.

### Stress load

Stress load was assessed by the questionnaire for stress and stress coping for children and adolescents (SSKJ) [16].

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.

## Results

The depressed girls had a mean value of  $19.3 \pm 7.5$ , the controls of  $9.7 \pm 6.4$  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).

The statistical analysis for comparison between depressed patients

**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

**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

and controls with MANOVA for all three scales simultaneously was significant with  $F(3, 144) = 16.2, p < 0.001$ .

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 stress coping for girls with major depression and controls ( $M \pm SD$ ).

The comparison of the means with a MANOVA for all 9 scales simultaneously yields  $F(9, 138) = 4.4, p < 0.001$ .

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 was present, they ruminate extensively over the situation. Resignation and aggression are also possible, whereas a lack of constructive reactions such as the search for social support can be observed.

Mean cortisol over time was analyzed by MANOVA for repeated measurement. A significant interaction effect between cortisol over time and comparison group was found,  $F(3, 132) = 3.01, p < 0.04$ . Excluding awakening all means were higher for girls with major depression.

Discriminant function analyses were used to classify the girls in depressed and nondepressed at time point II six months after the first assessment. As predictors, physical and psychological stress load, the cortisol awakening response, and different coping strategies were used. The canonical correlation served to evaluate the quality of classification. When including control of stress situation, a significant discriminant function was obtained. Chi Square = 53.0  $p < 0.001$  and a canonical correlation of 0.57. Psychological stress load, lack of coping but not hyperactivity of HPA axis contributed significantly to

classification.

When including passive avoidance, also a significant discriminant function was found. Chi Square = 50.7  $p < 0.001$ . The Canonical correlation was 0.56. Psychological stress load and the coping strategy itself had significant contributions to classification.

Positive self instruction again produced a significant discriminant function. Chi Square = 43.4 with a canonical correlation of 0.53  $p < 0.001$ . Only psychological stress load enabled a proper classification.

A similar result was obtained for the coping strategy seeking social support which also led to a canonical correlation of 0.53 and the relevance of psychological stress load as a predictor for classification.

## 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.

The discriminant function analyses extend previous findings insofar, as they show that in particular psychological stress load predicts a diagnosis of depression in a girl, considering different strategies to cope with stress. For classification hyperactivity of HPA axis seems to play only a minor role. Further studies are well in accordance with our results. In a study with standardized daily diaries in 15 years old depressed girls a higher stress vulnerability was a significant predictor for the maintenance of depression over time [17] a significant relationship of the degree of depression to destructive stress coping was reported by [18] school stress in particular was highly significant correlated with depression [19].

The results of this study for adolescents can be integrated into the cognitive model of Beck et al. [20] 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.

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