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# Influences on Stress Load in Young Girls with Major Depression

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**Abstract**

Based on former empirical studies and theoretical models the present study investigated, whether stress symptoms, stress coping, and activity of HPA axis are different in girls with major depression compared to non-depressed controls. 148 girls with a mean age of 15 years were studied twice with 6 months between the two assessments. 74 fulfilled DSM IV criteria for major depression at first assessment. Stress symptoms and stress coping were measured with validated German questionnaires. The cortisol awakening response was analyzed by collecting saliva samples. Depressed girls showed a greater stress load, which was significantly influenced by stress coping strategies. HPA axis activity was heightened in depressed girls, but does not seem to have an influence on stress load.

**Keywords:** Stress; Depression; Stress coping; Girls; Cognitive model

## Introduction

Depression in children and adolescents is frequent. In a representative sample from Germany a lifetime prevalence for depression in youth of 21% was found [1]. In Middle East countries 57% of youth have been observed to be depressed [2]. A unique and consistent framework for etiology and maintenance of depression in adolescents is not available at present. Reviewed are therefore empirically supported factors, that have been proposed by [3] as a basis for explaining depression in adolescents.

### 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 [4].

Children from families with a low income have a threefold greater risk to develop a depressive disorder. This has been confirmed in a study by [5].

### 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 can be identified [6].

A high stress load in the form of learning difficulties is seen in Chinese school children and contributed to the development and maintenance of depressive symptoms [24].

Increased stress load because of parental depression was responsible for depression and anxiety symptoms after a time interval of 6 months in young adolescents [25].

A high stress load because of symptoms from a conduct disorder was predictive for the severity of depression after 5 years [26].

Stress load in form of racial defamation was closely related to depression in Malaysia in youngsters who were investigated in a multicenter study [27].

When adolescents of both sexes are infected by HIV they feel a very high stress load and are prone to develop severe depressive symptoms [28].

A further confirmation of stress load correlated to depression is seen in Chinese adolescents belonging to a minority [29].

School going adolescents whose stress load was high because of academic dissatisfaction, parental discord and domestic harassment reported a remarkable rate of severe depressive symptoms [30].

Adolescents in Iran felt a high stress load which was mainly




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caused by life dissatisfaction and could be significantly associated to depressive symptoms in this sample [31].

A very large sample (n = 22000) revealed significant correlations between stress load and depressive as well as anxiety symptoms in young Chinese adolescents [32].

A high stress load at the university and within the family increased depressive symptoms in young students significantly. [33].

Lacking relationships to peers were involved in stress load for a German sample of 446 adolescents and significantly correlated to increased depression scores [34].

The important role of close social relationships such as good friends as a protecting factor against stress load and consequently prevention of depressive symptoms was well demonstrated in a study from Spain [42].

A massive stress load because of maternal depression was responsible for depressed mood in a longitudinal study over a span of 15 years [43].

The stress load was also high in young students who were investigated in Mexico. They felt massively affected by very strict lockdown prescriptions and a poor quality of life, which both contributed to their depression [35].

Large stress load because of restrictions in school and family was significantly correlated to severe depression in 600 adolescents, who were investigated in the United Arab Emirates [51].

Results from a treatment study are reported by [36]. The participants had a high stress load by conflicts with their parents. The family intervention did not lead to a significant reduction of the depressive symptoms in the adolescents but instead depression persisted in pre-treatment severity after termination of treatment.

The perception of conflicts in the parental relationship and a lack of social support by the parents can be interpreted as variables of high stress load and are longitudinally associated to depression in young adolescents [38].

### The Significance of Stress for the Depressive Disorder

A controlled study of [7] demonstrated that psychosocial stressors reinforce the depression and are also more frequent as a consequence of depression.

This has been supported in a study of [8] by a longitudinal analysis.

### Inadequate Stress Coping

Destructive stress coping in adolescents diagnosed as depressed has been found in [9].

### Neuroendocrine Findings

The severity of depressive symptoms is significantly correlated with cortisol levels during a laboratory stressor [10].

A long duration of depression leads to stress related hyperactivity of HPA axis [11].

A dysregulated feedback of cortisol secretion after stress is reported by [12]. 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 [13].

A combination of increased cortisol and good skills to manage everyday life proved to be a protective factor for depression in Chinese adolescents whose stressor was household dysfunction. [45].

A high stress load of adolescents, mainly due to a low SES of parents could be linked to daily fluctuations in cortisol in the sense of biological sensitivity [49].

The empirical literature shows, that depression in adolescents is characterized by a high stress load but on the other hand by inadequate stress coping. In a longitudinal design the present study investigated differences in stress load and stress coping between depressed girls and controls. Coping related influences on stress load were also proved. Differences in activity of HPA axis are taken into account, too.

## Methods

All Patients were recruited from the Department of child and adolescent psychiatry in a general hospital in Trier and fulfilled DSM IV criteria for major depression which was proved by a structured clinical interview [14]. 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:** 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.

**Table 2:** 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 load | 10.1 ± 2.7 | 11.8 ± 3.0 |
| Psychological stress load | 21.9 ± 5.5 | 27.6 ± 5.1 |

**Table 3:** 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 selfinstruction | 22.5 ± 5.0 | 18.0 ± 6.7 |
| SeekingSocial 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:** 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 |

### Questionnaires

The severity of depression was assessed by the Depression Inventory for Children and Adolescents (DIKJ) [15].

### Coping Strategies

Reactions to stressful situations were obtained by the coping questionnaire for children and adolescents (SVF-KJ) [16]. 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) [17].

The subscales comprise 1. Stress vulnerability 2. Physical stress load such as headache, stomach ache or exhaustion.

Psychological stress load 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 ± 7.5, the controls of 9.7 ± 6.4 on the Depression Scale.

The mean for the depressed girls was significantly higher and indicates clinically significant depression according to norm-tables for this questionnaire. 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.

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 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. $F(3,132) = 3.01$, $p < .04$. Excluding awakening all means were higher for girls with major depression.

By multiple linear regression analyses influences on stress load after six months are tested.

### Regression Analysis 1

Dependent variable was psychological stress load according to SSKJ

Predictors were the coping strategies resignation, seeking social support, passive avoidance and rumination, because large deficits in these coping strategies had been found.

The regression equation was significant with $F(4,147) = 9,3$ and an explained variance of 19%. As significant predictors could be identified the resignative coping, rumination, and lack of seeking social support.

### Regression Analysis 2

Dependent variable was psychological stress load according to SSKJ.

As an additional predictor to the coping strategies the physical stress load was included into the regression model, because somatic complaints play an important role in the depressed girls.

The regression equation was significant with $F(4,147) = 19,6$ and an explained variance of 34%. The significant predictors were resignation, lack of seeking social support and the physical stress load.

### Regression Analysis 3

This analysis considered initial severity of depression as a predictor for psychological stress load after six months besides the coping strategies and physical stress load, because this could be an important preventive factor for the maintenance of depression.

The regression equation was significant with $F(6, 146) = 19$, $4\ p< .001$ and an explained variance of 43%. Severity of initial depression as well as physical stress load was significant predictors.

When the activity of HPA axis, represented through cortisol awakening response was included as a predictor into the regression, no significant contribution to explain psychological stress load could be seen.

## Discussion

Female adolescents with depression reported a markedly higher stress load than non-depressed young girls. This was true for general vulnerability against stress, for psychological stress load and also for somatic signs of stress.

This is a confirmation of data which are known from former investigations.

In a study with standardized diaries in 15-year-old depressed children a heightened vulnerability to stressors such as family conflicts or school problems was a highly significant predictor for maintenance of depressive symptoms [18] and may also be interpreted as a risk factor for developing a depressive disorder. This correlation between stress load and depression has been seen in a case-control study, too.

Inadequate stress coping is also figured in [19]. A high degree of depression led to behavior such as denying stress, rumination, selfblame, and resignation, but not to constructive tries to deal with stress such as problem-solving.

Maladaptive emotion regulation strategies were observed in youth with ADHD and were significantly predictive of the depression in these adolescents [47].

In the present study the activity of the HPA axis does not play a significant role neither in explaining stress load nor in explaining stress coping. A similar result is given from [37] and can be taken as support for the presented empirical findings here.

This is further confirmed in an experimental study, which used examination stress to induce stress load and cortisol levels after awakening. Cortisol and negative mood were not significantly correlated during examination in females [59].

Patients with anorexia nervosa show a hyperactivity of HPA axis due to their malnutrition. At the same time, they feel highly depressed and anxious. A significant relationship between HPA axis functioning and the psychopathology, however, could not be confirmed and is in accordance with the present data [48].

In the data of 273 depressed adolescents no relationship between activity of HPA axis and depressive symptoms and stress load could be detected and provides a further confirmation of the present results [39].

Somewhat in contrast to our findings are the data from a small sample of 44 adolescents, whose hair cortisol was significantly associated to increases in negative mood. Stressors consisted in rigid restrictions for the adolescents due to lockdown [44].

Also, not completely in agreement with our findings were data from a sample of healthy adolescents, which were in favor of the response style in the form of rumination to explain depressive symptoms [52].

Stress coping by seeking social support was significantly correlated to levels of afternoon cortisol in a sample of 154 early adolescents. This means, that activity of HPA axis in depressed adolescents should be investigated not only with cortisol awakening response [50].

Independent of the activity of HPA axis anxious and depressed adolescents didn't seek social support in the form of professional help in a qualitative study with interviews. This is another example for inadequate coping and in good support for our data [53].

Hair cortisol as a marker of activity of the HPA axis representing the last three months was not different between young adults with mental health problems such as depression and controls [40]. This means further support for our negative results with regard to a possible significant role in explaining depression in adolescents mainly by biological factors.

Stress cortisol interactions may also be moderated by familial psychopathology in adolescents and a uni-directional interpretation of cortisol effects on adolescent depression is therefore not indicated [41].

The role of personality variables in explaining stress load in youth has been searched in a longitudinal study, but was not successful [46].

The results of the regression analyses are a meaningful extension of previous data in so far as a significant influence of coping strategies on stress load can be concluded.

Also, they point to the need of an early prevention of depressive disorders in youth, because initial severity of depression significantly influenced stress load 6 months later.

The results which have been found for depressed adolescents can be integrated into a cognitive model of depression that has been proposed for adults by [20]. A high stress load on a physiological as well as psychological level activates in the short term inadequate stress coping strategies and cognitions such as resignation, rumination or aggression which prevent an adequate coping in the longterm and therefore promotes maintenance of depressive symptoms. Empirical support for this interpretation comes from a longitudinal study of [21], who investigated cognitive factors in depressed adolescents and confirmed the hypothesis of Beck instead of the response style theory. This is further confirmed by two other studies [22,23].

## Clinical Implications

The empirical literature suggests that a specialized training of emotion recognition may significantly reduce severe depressive symptoms in young adolescents [54].

A comparative study evaluated the outcome of behavioral as well as psychoanalytical interventions [55]. A psycho educational program proved to be most successful with regard to diverse outcome criteria in the depressed adolescents.

Such a manual based cognitive behavioral intervention consisting of only six sessions and psychosocial therapy was also evaluated in a pre-post design and reduced depression significantly, in particular in younger adolescents and boys [56].

Another program aiming to improve depression as well is anxiety in young adolescents can be recommended from [57]. The program is internet delivered and therefore very feasible for young adolescents.

The effectiveness of several antidepressants has been shown in a large-scale study from Taiwan [58].

The present study cannot be interpreted without limitations. The sample size was relatively small and only girls have been investigated. A generalization to boys at the moment is not possible. The age range was restricted to younger adolescents. Further it has to be considered that all information was based on selfratings and future investigations should take into account external evaluation.

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## Statement of Ethics

The study was approved by the ethics committee of the University of Trier.

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