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## Treatment of Attention Deficit/Hyperactivity Disorder With Amphetamine: Short-Term Effects on Family Interaction.

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## **Treatment of Attention Deficit Hyperactivity Disorder with Amphetamine. Short Term Effects on Family Interaction.**

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RUNNING HEAD: ADHD, Amphetamine and Family Interaction

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**Abstract**

**Objective:** This research seeks to study the impact on family function after 3 months of treatment with amphetamine. **Method:** A total of 43 children, 6 to 11 years of age, with ADHD were treated with amphetamine for 3 months. Family function was studied before and after treatment by parent self-rating and independent observer ratings of videotaped parent-child interactions. **Results:** The families with a child with ADHD were found to be more dysfunctional than control families. Families with children with severe ADHD-behavior showed evidence of more family dysfunction compared to families with children with less severe ADHD behavior. After 3 months of treatment with amphetamine, the children's behavior and the mother's well-being and some aspects of parent-reported and observer-rated family functioning improved. **Conclusion:** This study gives support to the notion that some aspects of family dysfunction may be related to the child's ADHD behavior.

**KEY WORDS:** attention deficit/hyperactivity disorder; family function; videotaped family tasks; amphetamine treatment

In this article, we address the question of how a child's ADHD symptoms may interact with the family's functioning. Bowlby (1973) described how emotional bonding is important for the normal development of a child and a prerequisite for mental and physical health. The work by Minuchin, Rosman and Baker (1978) became the foundation of the idea that the pattern of family function could cause symptoms in the child, first emanating from their description of the psychosomatic family with an enmeshed, rigid family pattern, which enhanced psychosomatic illness in children. Although their findings never have been replicated (Coyne, & Anderson, 1988; Humphrey, 1987; Loader, Kinston, & Stratford, 1980), this influential work has been difficult to challenge. Gustafsson, Björkstén and Kjellman (1994) have put forward the idea that the child's symptoms may organize the functioning of the family and that there is an interaction between the symptoms of a child and the family functioning working in both directions. Some aspects of family function, which is regarded as dysfunctional in an ordinary family, might be quite functional in a family with a child with a physical or mental disorder.

Family dysfunction is a risk factor for conduct disorder, but conduct disorder is often comorbid with ADHD (Sandberg, 2002). An association has been found between child hyperactivity and poor parent coping, disciplinary aggression, negative affect, lower parental sensitivity to child needs, authoritative parenting style, inconsistent parenting style, parental disagreement, marital discord, maternal depression and parental asocial behaviour (Sandberg, 2002). The causal direction of these associations have not been established. Insecure attachment has been suggested to play a role in development of ADHD (Stiefel, 1997). Recently Pinto, Turton, Hughes, White and Gillberg (2006) reported a link between scores for disorganized attachment disorder among children one year of age and teacher-rated ADHD symptoms at age 7, but there was no association with a clinical diagnosis of ADHD. Families

with a child diagnosed with ADHD are reported to have more child-parent conflicts (Barkley, 1996; Johnston, 1996; Johnston & Mash, 2001; Wells et al., 2000) and higher levels of family distress (Barkley, 1996) than do families with children without ADHD problems. Parents of children with ADHD have been found to be more directive and commanding, show more disapproval, give fewer rewards and show a more negative behavior towards their child compared to parents of control families (Barkley, Fischer, Edelbrock, & Smallish, 1991; Barkley, Guevremont, Anastopoulos, & Fletcher, 1992; Johnston, 1996; Johnston & Mash, 2001). Both medication and behavioural treatment of the child may be effective in reducing aspects of family stress (Johnston, & Mash, 2001; Wells et al., 2000).

It is not clear if the family stress in families with a child with ADHD is caused by the child's symptoms or if the child is affected by the family stress so that ADHD-symptoms become worse. In most studies the main informants of the child's behavior are the parents who themselves are part of the family system. Earlier studies have shown that there often are discrepancies among reports from different sources, such as children's self reports, parents' reports, and teachers' reports (Sawyer, Clark, & Baghurst, 1993; Verhulst, & van der Ende, 1992). Parents may have a bias in their description of the family and their child, reflecting other factors than the child's behavior in family interactions. For instance, parents may answer questions according to their own mental well-being (Murray et al., 1999). Using different sources in the assessment of family functioning should lead to a better clarification of these intricate associations.

**Aims of the study:**

In the present study, both independent observers and the parents themselves are used to describe interaction in families with and without a child with ADHD to test the following hypotheses:

- 1) Because family function in ADHD may be influenced by the child's symptoms, we have supposed that families with a child diagnosed with ADHD are more dysfunctional than normal control families. This should be possible to detect with global measures of family functioning and with measures of monitoring, parent influence, negative attribution, and chaos, family variables that might be expected to be of relevance according to earlier studies (Sandberg, 2002).
- 2) Because there may be a relation between ADHD symptoms and family dysfunction, we have assumed that before pharmacological treatment, high symptom scores of ADHD are associated with a high degree of family dysfunction.
- 3) As family function may be related to the child's behavior, family function should improve after 3 months of treatment of the child with amphetamine, as the ADHD symptoms improve.
- 4) If the child's behavior improves, the parents' psychiatric well-being might also improve after 3 months of treatment of the child with amphetamine.

## Method

### Study Design-Participants

The *study group* included 45 children (36 boys and 9 girls) ages 6 to 11 from two sites participating in a multi-center study (five sites) concerning treatment with central stimulants of children with ADHD according to the third edition, revised of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1987; Gillberg et al., 1997). All children had an IQ of more than 50, did not meet criteria for autistic disorder,

and had no severe somatic disorder. Of the originally 45 children, 43 children (34 boys and 9 girls) participated in the study. Demographic data are shown in table 1.

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Insert table 1 about here  
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## Procedure

The families were examined on two occasions. The first occasion was prior to treatment (0 months) and the second was after 3 months of treatment with amphetamine (dose  $M = 0.52$  mg/kg/day, range = 0.20 to 1.10 mg/kg/day). The racemic mixture of amphetamine was used, and the children received no other treatment.

## Measures

*Assessment of the children's behaviour.* Conners's abbreviated rating scale (parents) and Conners's teacher questionnaire was used (Conners, 1990). These rating scales have been extensively used in Sweden in school-aged children to measure behavioral abnormality. The scores were taken as representing the degree of ADHD symptoms. Reliability has been studied by Goyette, Conners and Ulrich (1978) and Mash and Johnston (1983). Correlations of interparent agreement were found to be on the order of .55 to .71, and parent-teacher agreement on the order of .49. As a basis for comparison with the study group concerning Conners's parent questionnaire, normative data from 233 children from a school in Malmö were used (Ericsson, 2003). No Swedish normative data were available for the Conners's teacher questionnaire.

*Assessment of parental symptomatology.* The Symptom Check List (SCL-90), answered by both mothers and fathers at 0 months and at 3 months, was used. SCL-90 is a self-report

questionnaire with 90 questions measuring general psychiatric symptoms and symptoms of stress and discomfort during the preceding last 6 months (Derogatis, 1979). The questionnaire reflects nine dimensions of different symptoms (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) and a total score, the Global Severity Index (GSI). Each of the 90 items is rated from 0 to 4. Zero means no symptoms and 4 means an extremely high level of symptoms. The Swedish standardization of the instrument has shown a Cronbach's alpha of .73 to .91 for the subscales and .97 for the GSI in a normal group, which was used as a comparison group (Fridell, Cesarec, Johansson & Malling Andersen, 2002). In this study, we analyzed the GSI and the dimensions of somatization, depression, and anxiety, which were chosen because earlier studies have shown that mothers of children with ADHD have more depression and depression-related symptoms than do controls (Sandberg, 2002).

Assessment of family function included the following.

*Assessment of family function by using the self-report questionnaire Family Relations Scale (FARS).* FARS is made up of 46 items and consists of five factors: attribution, interests, isolation, chaos, and enmeshment. High values indicate family dysfunction. FARS has shown high reliability (internal consistency, with Cronbach's  $\alpha = .94$  for mothers and  $.92$  for fathers) and long-term stability over 6 years ( $r = .77$  for mothers and  $r = .45$  for fathers). Covariance between FARS and other family measurements and differences between the clinical and nonclinical samples show that validity is satisfactory (Höök & Cederblad, 1992). Both fathers and mothers answered the questionnaire.

*Assessment of family tasks by using observer rated videotapes.* Three videotaped standardized family situations (completing a puzzle, solving a conflict situation, and planning

of a shared activity) were used. These were analyzed and scored by independent raters according to Beavers' Family Competence Scale (Beavers & Hampson, 1990). A homework situation with the mother was analyzed and scored with The Dyadic Family Interaction (DFI; Hansson, Eberhardt, & Balldin, 1999). The family tasks were done in the same order for all families. The raters were blinded concerning the time of measurement (time 0 or after 3 months of treatment) and the severity of the child's ADHD symptoms.

Beavers's Family Competence Scale is one of the two scales of Beavers's Observational Scale and has been translated to Swedish (Beavers & Hampson, 1990; K. Hansson, 1989b). Beavers's Family Competence Scale consists of 13 items, with the last item being a global assessment of family functioning. High values indicate good family functioning. By adding 12 of the items (all except the global assessment) a total sum can be calculated. The Beavers's Family Competence Scale has been shown to have good reliability and validity (Hulgus, Hampson, Beavers & Beavers, 1988). The interrater reliability for observer pairs has proven to be good, ranging from .90 to .96 (Thernlund et al., 1995). The validity of the Beavers's Family Competence has been estimated by its ability to differentiate between normal families and families with an identified child psychiatric patient and has been found to be good (Hansson, 1989a). Beavers's Family Competence results were compared with results from a study of 56 normal Swedish school children (mean age of the child 8.23 +/- 4.00 years; 30 girls, 26 boys), in which children with diabetes were compared with normal controls (Thernlund et al., 1995).

The DFI is a Swedish translation of the Family Interaction Global Coding System devised by Hetherington and Clingempeel (1992). The reliability and the validity of this instrument have been shown to be good (Hetherington & Clingempeel, 1992; Reiss et al., 1994; Reiss et al., 1995). A Swedish study from 1999 has shown comparable results with good interrater reliability ( $r = .92$ ), test-retest reliability (for different subscales  $r = .66$  to  $.88$ ) and

validity (Hansson et al, 1999). This study consisted of families of female twins from the Swedish twin registry with a child in the age range of 10 to 18 years. A factor analysis identified four factors: social support, conflict, depression and problem solving. These factors have been used in our study. The face validity was judged to be good on the basis of theoretical considerations and was analyzed by constructing a “normal family” from the mean values in the normal group. The “normal family” was then evaluated by the researchers in the study, and there was a consensus that the constructed family is representative of Swedish normal families. The results were compared with the earlier American studies and were found to be comparable with some minor differences. In the present study, the mother-child dyad was scored according to the DFI and was compared with a comparison group of 624 mother-children pairs from the study by Hansson et al (1999). The DFI was only used with families from one of the sites (23 children out of 29).

### **Attrition**

The attrition rate for the different parts of the study is presented in table 2. Concerning the different questionnaires, there was variable attrition because parents and teachers did not return questionnaires handed out or because they turned in incompletely answered questionnaires. For the variables of Conners’s parent ratings, Conners’s teacher ratings, FARS according to mothers, FARS according to fathers, SCL-90 concerning mothers and SCL-90 concerning fathers, a comparison was made between individuals with data from both occasions (0 and 3 months of treatment) and those with data from only one occasion. Conners’s parent rating scores were also compared for the children with complete data concerning FARS and SCL-90 and those with data from only one occasion. No significant differences were found using the Mann-Whitney U-test.

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Insert table 2 about here  
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The Beavers's Family Competence was used with 39 of the 43 families but 7 of the videotapes were not analyzed because of poor technical quality. This resulted in 32 cases to analyze. For 23 families, there are also data for DFI. A comparison was made between the families with both DFI and Beavers's data ( $n = 23$ ) and the group with only Beavers's ( $n = 9$ ). No significant differences between the means of the Conners's ratings were found, indicating the same amount of symptoms in the different groups.

### **Statistical analysis**

Comparisons between independent groups were made by student's  $t$  test and the Mann-Whitney  $U$  test, and, for dependent samples, paired student's  $t$  test and the Wilcoxon signed rank test was used. Fisher's exact test was used to compare change (more or less than one standard deviation) from 0 to 3 months. Individuals differing more than one standard deviation from the population mean were compared to individuals with values differing less than one standard deviation. For correlations between DFI and Conners's ratings and between SCL-90 and Conners's ratings, the Pearson correlation equation was used. For analysis of other correlations, Spearman correlations were used.

### **Ethical considerations**

The study was approved by the Human Research Ethics Committee, Faculty of Medicine, Umeå University (1990, 49/90).

## Results

### Before treatment – baseline

*Child ADHD symptoms and parental psychiatric well-being.* According to the Conners's parent and teacher questionnaires, the ADHD children displayed significantly more symptoms than did normal controls ( $p < .001$ ; table 3). There was no significant correlation between parents' and teachers' ratings.

Mothers' and fathers' scores on the SCL-90 GSI did not significantly differ from normal controls, and the same was true for both sexes and the SCL-90 subscales, except for fathers on the subscale depression. Fathers scored higher than controls on depression ( $p < .05$ ). On the SCL-90, mothers of children with ADHD ( $n = 33$ ) showed an association between Conners's ratings and high levels of anxiety ( $r = .46, p < .05$ ), depression ( $r = .46, p < .05$ ) and somatization ( $r = .45, p = .008$ ). There were no associations between the fathers' SCL-90 scores and Conners' ratings.

*Family dysfunction.* On the FARS, both mothers and fathers with an ADHD child scored higher on the total score than normal controls (Table 4). Mothers scored higher on the Attribution, Isolation, Enmeshment and Chaos subscales than did the control mothers. The fathers scored higher than normal controls on all subscales (Table 4).

Families with a child diagnosed with ADHD were found to be more dysfunctional, measured by the total sum of the Beavers's Family Competence Scale ( $n = 32$ , score = 29.0,  $SD = 7.2$ ), than the control families ( $n = 56$ , score = 36.3,  $SD = 7.2$ ;  $p < .001$ ) according to the Mann-Whitney  $U$  test, but there was no significant statistical difference in any single item. The measures of the DFI scales of warmth or support, openness or vulnerability, and monitoring of the child's social behavior showed a significantly more dysfunctional pattern among ADHD families compared to normal controls. On two measures, ADHD families

showed better functioning, with a lower level of wrath or rejection and a higher level of influence or control.

*Correlations between ADHD-symptoms and family function.* Conners's parent scores of child behavior correlated positively with the mothers FARS scores ( $n = 33$ ,  $r_s = .40$ ,  $p < .05$ ) but not with the fathers' scores on FARS. The fathers' scores on FARS showed no significant correlation with Conners's parent scores, Conners's teacher scores, or the scores on the Beavers's Family Competence Scale. Teachers Conners's scores did not correlate with FARS according to either mothers or fathers.

When the DFI factors were analyzed, two of the four factors showed significant correlations (single-tailed) with Conners's parent questionnaire at 0 months. These were the factors conflict ( $n = 21$ ,  $r = .42$ ,  $p < .05$ ) and depression ( $n = 21$ ,  $r = .47$ ,  $p < .05$ ).

*Children with learning disabilities.* We had several children with low IQ or learning disabilities in our study (35%).

A separate analysis was made for this group concerning ADHD symptoms and family functioning. No significant differences were found between children with and without cognitive difficulties.

### **After three months of amphetamine treatment**

ADHD-symptoms. After three months of treatment with amphetamine, Conners's scores according to both parents and teachers significantly improved (Table 3). There were no

differences between children with and without learning disabilities concerning this improvement.

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 Insert table 3 about here  
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*Psychiatric well-being of the parents.* Total scores on SCL-90 ( $n = 33$ ,  $p < .05$ ) and the subscales Anxiety ( $n = 33$ ,  $p < .05$ ) and Depression ( $n = 33$ ,  $p < .05$ ) significantly improved for mothers. The Depression subscale improved for the fathers ( $n = 30$ ,  $p < .05$ ). Because we had several children with learning disabilities in our study, separate analyses were made for children with and without learning disabilities. For children with learning disabilities (11 of 33), there was no significant improvement of total SCL-90 scores for the mothers after 3 months of treatment with amphetamine.

*Family function.* The total FARS scores were significantly reduced for both mothers and fathers. Among the subscales, Attribution was significantly improved for both mothers and fathers, and Enmeshment was significantly improved for mothers after 3 months of medication (Table 4). When FARS scores were separately analyzed for children with learning disabilities (10 children) and without learning disabilities (23 children), we found no significant improvement of total scores or in any of the subscores for the children with learning disabilities after 3 months of treatment. For children without learning disabilities, there were significant differences concerning total scores and attribution, but not concerning enmeshment.

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 Insert table 4 about here

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The individuals with FARS-values more than one standard deviation above the mean were separately studied. After treatment, these individuals changed their total FARS values according to the mothers more than one standard deviation in normal direction significantly more often than other individuals ( $p < .01$  according to Fisher's exact test). The same was true even for the subscales of Attribution, Isolation, Chaos and Enmeshment. On FARS according to mothers, the changes in both Chaos ( $r_s = .43$ ,  $p < .05$ ) and Enmeshment ( $r_s = .38$ ,  $p < .05$ ) correlated with degree of symptom reduction. When the FARS values according to fathers were analyzed in a similar way, the results did not reach significance.

Total family functioning according to the Beavers's Family Competence Scale improved after 3 months of treatment with amphetamine ( $n = 31$ , score before treatment = 29.0,  $SD = 7.2$ ; score after treatment = 30.6,  $SD = 7.3$ ;  $p < .05$ ), as did the measures of responsibility ( $n = 31$ , score before treatment = 2.5,  $SD = 7.2$ ; score after treatment = 3.0,  $SD = 0.7$ ;  $p < .05$ ) and empathy ( $n = 31$ , score before treatment = 2.2,  $SD = 0.8$ ; score after treatment = 2.6,  $SD = 0.9$ ;  $p < .05$ ).

The DFI conflict and depression factors were not significantly changed after treatment, but the correlation between these two factors and the severity of ADHD symptoms measured by the Conners's parent questionnaire disappeared. Mothers with values of the DFI item monitoring more than one standard deviation below the population mean were compared to mother with normal values of monitoring. After 3 months of treatment of the child, a significantly greater percentage of mothers with low monitoring scores increased their monitoring score more than one standard deviation compared to mothers with normal monitoring scores ( $p < .01$  according to Fisher's exact test). In the same way, mothers with values of the item influence or control exceeding one standard deviation above the population mean were compared with mothers with normal influence or control scores. The percentage of

mothers showing much influence or control who decreased their scores by one standard deviation was greater than the percentage of mothers with normal scores ( $p < .05$  according to Fischer's exact test).

There was no significant correlation between degree of symptom reduction and degree of change in observed family functioning (Beavers's Competence Scale and DFI).

## Discussion

To our knowledge, this is one of few studies of the impact on family dynamics as a consequence of medical treatment of a child with ADHD in the family. The findings will be discussed in connection with the hypothesis put forward in the introduction. When drawing conclusions, one has to keep in mind that the sample size was small and that there also was a problem with internal dropouts of different questionnaires and measures and technical problems leading to a smaller sample to analyse than was expected.

Both subjective self-report from parents and assessment by independent observers showed that the families with a child with ADHD were scored as more dysfunctional than comparison families, thus supporting our first hypothesis and findings in other studies cited in the introduction that families with a child diagnosed with ADHD are scored as more dysfunctional than are normal control families. Still this can be problematized because family function in a family with a child with ADHD can be different (of a kind usually described as dysfunctional) because of adjustment to the specific demands posed by the child's ADHD symptoms. This family function might be appropriate in its context and not dysfunctional.

The FARS scores according to mothers positively correlated with Conners's parent ratings, supporting the second hypothesis, that the child's degree of symptoms correlates with degree of family dysfunction. Even the DFI factors conflict and depression were found to correlate with Conners's parent ratings, which also supports this hypothesis. An alternative explanation could be that mothers with symptoms of mental distress experience their child as more disturbed in his or her behavior and their family as more dysfunctional than they would if they were feeling well.

The children clearly benefited from amphetamine treatment during the 3-month study period according to both parent and teachers, an improvement that remained 15 months after starting treatment (Gillberg et al., 1997).

Our third hypothesis was that family dysfunction is related to the child's behavior and that family dysfunction should improve after 3 months of medical treatment as the child's behavior improves. The Conners's ratings according to parents and teachers showed a significant improvement after 3 months of treatment with amphetamine, and so did total FARS score and the subscores of Attribution and Enmeshment (except for the children with learning disabilities). That the family function in families with a child with learning disabilities did not improve might be expected because a substantial part of the family's difficulties might depend on symptoms of the child's learning disabilities, which are not expected to significantly diminish after treatment with amphetamine. The total score and the measures of responsibility and empathy on the Beavers's scale improved. A low level of monitoring is considered a risk factor for conduct disorder (Snyder, Cramer, A Frank, & Patterson, 2005; Snyder & Patterson, 1986). Mothers showing less than normal values on the DFI subscale monitoring increased their monitoring after 3 months of treatment. Several studies have shown that a child with ADHD elicits more controlling behaviour from adults (Barkley et al., 1991; Barkley et al., 1992; Johnston, 1996; Johnston, & Mash, 2001). The mothers with a high degree of influence or control according to the DFI subscale showed a greater reduction of this behavior compared to mothers with normal levels of influence or control according to DFI. Perhaps this reflects the greater need for controlling behaviour by the parents when the child has many symptoms of ADHD. When the child's symptoms decrease, less controlling behavior might be needed.

The DFI is a measure of dyadic interaction. Interestingly, the DFI measures hardly showed any change after 3 months of treatment, unlike FARS and Beavers's measures, which are to a greater extent global measures of family function. The DFI is assumed to measure qualitative aspects of the mother-child relation, and these aspects might not change so readily, even if the child's ADHD symptoms are reduced by medication. Perhaps interventions other than medication, such as family interventions, are needed, or it may be that a longer time period is required for changes to occur in the DFI. Both parent self-report and observer ratings showed improvements of family functioning after 3 months of treatment with amphetamine. This may support the hypothesis that at least some degree of family dysfunction is related to the child's behavior. There is of course a possibility that part of the dysfunction is explained by a regression to the mean over time.

The statistical correlations between ratings of the child's symptoms and measures of family functioning seen at 0 months disappeared after 3 months of treatment with amphetamine. There was no correlation between degree of symptom reduction according to parents and teachers and degree of improvement in family functioning according to observers. This seems to indicate a complex relationship among the variables. Perhaps the correlation between the child's symptoms and family functioning disappears after treatment because other factors influencing the family functioning will get relatively more important when the ADHD symptoms are reduced. These other factors may operate differently in different families, creating a wide variation and thereby obscuring the expected correlation with the symptom reduction of the child.

The ratings according to SCL-90 showed that the parents of the children with ADHD did not have significantly more psychiatric symptoms than parents in normal control families, except for fathers of children with ADHD having slightly more symptoms of depression than did normal controls. More symptoms of parental depression and other psychiatric problems

have been described in families with a child with ADHD (Barkley et al., 1991; Cunningham, Benness, & Siegel, 1988), which we thus could not confirm in this study. Nevertheless, mothers of children with severe ADHD symptoms were more depressed and showed greater anxiety and somatization compared to mothers of children with fewer symptoms. The mothers' symptoms may be caused by the children's behavior, but another possibility is that mothers with symptoms of depression, anxiety or somatisation negatively influence their children, thereby increasing their ADHD symptoms. After 3 months of treatment, these symptoms were reduced in accordance with our fourth hypothesis, except for the children with learning disabilities, and there was no longer a correlation between mothers' symptoms and children's ADHD symptoms. This could mean that at least some of the symptoms of the mothers were related to children's ADHD symptoms, even if the effect is not great enough to cause the mothers of families with a child with ADHD to have significantly more symptoms than normal controls. That there was no improvement for children with learning disabilities might be explainable because the child's learning disabilities are not expected to significantly diminish after treatment with amphetamine.

Our results seem to support the hypothesis that a child's symptom organises the functioning of the family, a hypothesis put forward by Gustafsson et al (1994). Thus, in our study, the families showed more hostility, attribution, isolation, chaos and enmeshment than normal controls. After treatment the families showed less hostility and more of responsibility and empathy.

Finally, we could not see any significant correlation between parent and teacher ratings in our study. This supports earlier descriptions of poor agreement between raters meeting the child under different circumstances (Achenbach, McConaughy, & Howell, 1987).

## **Conclusion**

The results from this study render support to all four hypothesis, but the relationships among the variables seem to be rather complex. This study must be interpreted with great caution. The material is limited, and the concepts are complicated, with presumably some unrevealed interactions between the different factors. On the other hand and interestingly, the results in our study support results from several other studies indicating that the child's symptom may influence family functioning, causing more controlling and negative behavior from the parents. The results show that pharmacological treatment of the child not only results in child behavior improvement but is also beneficial for parental well-being and may alter the family functioning. Further studies with greater numbers of families and a longer period of follow-up are needed to confirm these results.

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## References

- Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: implications of cross-informant correlations for situational specificity. *Psychological Bulletin*, 101(2), 213-232.
- Barkley, R. A. (1996). Attention-deficit/hyperactivity disorder. In E.J. Mash, & R.A. Barkley (Eds.), *Child Psychopathology* (pp. 63-112). New York: Guilford.
- Barkley, R. A., Fischer, M., Edelbrock, C., & Smallish, L. (1991). The adolescent outcome of hyperactive children diagnosed by research criteria--III. Mother-child interactions, family conflicts and maternal psychopathology. *Journal of Child Psychology and Psychiatry*, 32(2), 233-255.
- Barkley, R. A., Guevremont, D. C., Anastopoulos, A. D., & Fletcher, K. E. (1992). A comparison of three family therapy programs for treating family conflicts in adolescents with attention-deficit hyperactivity disorder. *Journal of Consulting and Clinical Psychology*, 60(3), 450-462.
- Beavers, R., & Hampson, R. (1990). *Successful families. Assessment and intervention*. New York: Norton.
- Bowlby, J. (1973). *Attachment and loss*. London, UK: Penguin.
- Conners, C. K. (1990). *Conners Rating Scales Manual, Conners Teachers Rating Scales, Conners Parent Rating Scales. Instruments for use with Children and Adolescents*. North Tonawanda, NY: Multihealth Systems.
- Coyne, J.C., & Anderson, B.J. (1988). The "psychosomatic family" reconsidered: diabetes in context. *Journal of Marital and Family Therapy*, 14, 113-123.

- Cunningham, C., Benness, BB, & Siegel, LS. (1988). Family functioning, time allocation, and parental depression in the families of normal and ADDH children. *Journal of Clinical Child Psychology*, 17, 169-177.
- Derogatis, L. R. (1979). *SCL-90: Administration, Scoring and Procedure Manual for the Revised Version of the SCL-90*. Baltimore: The John Hopkins University School of Medicine.
- Ericsson, I. (2003). Motorik, koncentrationsförmåga och skolprestationer - En interventionsstudie i skolår 1-3. [ Motor skills, attention and academic achievements - An intervention study in school year 1-3.] Unpublished doctoral dissertation, Malmö University, Sweden.
- Fridell, M., Cesarec, Z., Johansson, M., & Malling Andersen, S. (2002). *Symptoms Checklist 90 svensk normering, standardisering och validering av symtomskalan*. [Swedish norms, standardisation and validation of the symptoms checklist-90 scale]: Sweden: Statens Institutionsstyrelse SiS.
- Gillberg, C., Melander, H., von Knorring, A. L., Janols, L. O., Thernlund, G., Hagglof, B., et al. (1997). Long-term stimulant treatment of children with attention-deficit hyperactivity disorder symptoms. A randomized, double-blind, placebo-controlled trial. *Archives of General Psychiatry*, 54(9), 857-864.
- Goyette, C. H., Conners, C. K., & Ulrich, R. F. (1978). Normative data on revised Conners Parent and Teacher Rating Scales. *Journal of Abnormal Child Psychology*, 6(2), 221-236.
- Gustafsson, P. A., Bjorksten, B., & Kjellman, N. I. (1994). Family dysfunction in asthma: a prospective study of illness development. *The Journal of Pediatrics*, 125(3), 493-498.

- Hansson, K. (1989a). *Familjediagnostik* [Family Diagnosis]. *Doctoral dissertation*.  
Unpublished Doctoral dissertation, University of Lund, Sweden.
- Hansson, K. (1989b). Familjediagnostiska modeller [Family diagnostic models]. Cederblad, M., Hansson, K., editors. *Familjeterapi* [Family Therapy]. *Psykisk Hälsa, Suppl. 30*.  
Lund, Sweden
- Hansson, K., Eberhardt, A., & Balldin, T. (1999). *Dyadisk familjeinteraktion* [Dyadic Family Interaction]. Lund, Sweden: Department of Child and Adolescent Psychiatry, University of Lund.
- Hetherington, E. M., & Clingempeel, P. (1992). *Coping with marital transitions - A family systems perspective. Monographs of the society for research in child development*. (Vol. 57). Chicago: The University of Chicago press.
- Hulgas, Y. F., Hampson, R.B., Beavers, W.R., & Beavers, J. (1988). *The Beavers systems model of family assessment: norms, validity and reliability*. Dallas TX: Southwest Family Institute.
- Humphrey, L. L. (1987). Comparison of bulimic-anorexic and nondistressed families using structural analysis of social behavior. *Journal of the American Academy of Child and Adolescent Psychiatry*, 26(2), 248-255.
- Höök, B., & Cederblad, M., (1992). *FARS - Familjerelationsskalan* [Family relations scale].  
Lund, Sweden: Department of Child and Adolescent Psychiatry, University of Lund.
- Johnston, C. (1996). Parent characteristics and parent-child interactions in families of nonproblem children and ADHD children with higher and lower levels of oppositional-defiant behavior. *Journal of Abnormal Child Psychology*, 24(1), 85-104.
- Johnston, C., & Mash, E. J. (2001). Families of children with attention-deficit/hyperactivity disorder: review and recommendations for future research. *Clinical Child and Family Psychology Review*, 4(3), 183-207.

- Loader, P., Kinston, W., & Stratford, J. (1980). Is there a psychosomatogenic family? *Journal of Family Therapy*, 2, 311-326.
- Mash, E. J., & Johnston, C. (1983). Parental perceptions of child behavior problems, parenting self-esteem, and mothers' reported stress in younger and older hyperactive and normal children. *Journal of Consulting and Clinical Psychology*, 51(1), 86-99.
- Minuchin, S., Rosman, B.L., & Baker, L. (1978). *Psychosomatic families*. Cambridge MA: Harvard University Press.
- Murray, L., Sinclair, D., Cooper, P., Ducournau, P., Turner, P., & Stein, A. (1999). The socioemotional development of 5-year-old children of postnatally depressed mothers. *Journal of Child Psychology and Psychiatry*, 40(8), 1259-1271.
- Pinto, C., Turton, P., Hughes, P., White, S., & Gillberg, C. (2006). ADHD and infant disorganized attachment: a prospective study of children next-born after stillbirth. *Journal of Attention Disorders*, 10(1), 83-91.
- Reiss, D., Hetherington, E. M., Plomin, R., Howe, G. W., Simmens, S. J., Henderson, S. H., et al. (1995). Genetic questions for environmental studies. Differential parenting and psychopathology in adolescence. *Archives of General Psychiatry*, 52(11), 925-936.
- Reiss, D., Plomin, R., Hetherington, E.M., Howe, G., Rovine, & M., Tryon, A. (1994). The separate worlds of teenage siblings. In E.M. Hetherington, D. Reiss, & R. Plomin, (Eds.), *Separate social worlds of siblings: impact of non-shared environment on development*. Hillsdale, New Jersey: Erlbaum Associates, Inc.
- Sandberg, S. (2002). Psychosocial contributions. In S. Sandberg (Ed), *Hyperactivity and attention disorders of childhood. Second edition*. (pp. 367-416). Cambridge, UK: Cambridge University Press.

- Sawyer, M. G., Clark, J. J., & Baghurst, P. A. (1993). Childhood emotional and behavioural problems: a comparison of children's reports with reports from parents and teachers. *J Paediatric Child Health*, 29(2), 119-125.
- SCB. (2006), [Statistics Sweden]. Retrieved August 31, 2006 from Statistic Sweden Web site: <http://www.ssd.scb.se/databaser/makro/Visavar.asp>
- Snyder, J., Cramer, A., A Frank, J., & Patterson, G. R. (2005). The contributions of ineffective discipline and parental hostile attributions of child misbehavior to the development of conduct problems at home and school. *Developmental Psychology*, 41(1), 30-41.
- Snyder, J., & Patterson, G. R. (1986). The effects of consequences on patterns of social interaction: a quasi-experimental approach to reinforcement in natural interaction. *Child Development*, 57(5), 1257-1268.
- Stiefel, I. (1997). Can disturbance in attachment contribute to ADHD? A case discussion. *Clinical Child Psychology & Psychiatry*, 2(1), 45-64.
- Thernlund, G. M., Dahlquist, G., Hansson, K., Ivarsson, S. A., Ludvigsson, J., Sjoblad, S., et al. (1995). Psychological stress and the onset of IDDM in children. *Diabetes Care*, 18(10), 1323-1329.
- Wells, K. C., Epstein, J. N., Hinshaw, S. P., Conners, C. K., Klaric, J., Abikoff, H. B., et al. (2000). Parenting and family stress treatment outcomes in attention deficit hyperactivity disorder (ADHD): an empirical analysis in the MTA study. *Journal of Abnormal Child Psychology*, 28(6), 543-553.
- Verhulst, F. C., & van der Ende, J. (1992). Agreement between parents' reports and adolescents' self-reports of problem behavior. *Journal of Child Psychology and Psychiatry*, 33(6), 1011-1023.

**Table 1:** Socio-economic status and comorbidity.

	Study population		The general Swedish population
	N	%	%
Socio-economic status*			
unclear			10
low <sup>+</sup>	26	60	45
medium <sup>+</sup>	10	23	25
high <sup>+</sup>	7	16	20
Comorbidity			
Mild mental retardation or learning disabilities	15	35	
Oppositional defiant disorder	13	30	

\*SCB, 1990 (SCB, 2006).

<sup>+</sup> low= blue collar worker, medium=white collar worker without university education or leading position, high=university education or leading position

**Table 2:** Instruments used in the study and the number of individuals contributing to the data for each variable.

Instrument	Number of individuals (zero months)		Number of individuals (three months)		Number of individuals with complete data (zero and three months)	
	n	%	n	%	n	%
Conners' abbreviated questionnaire (parents)	41	95.3	39	90.8	38	88.4
Conners' teacher questionnaire	41	95.3	28	65.1	26	60.5
FARS – mothers	35	81.4	36	83.7	33	76.7
FARS - fathers	30	69.8	28	65.1	27	62.8
Dyadic Family Interaction (DFI)*	23	79.3	23	79.3	23	79.3
Beavers' Family competence scale	32	74.4	32	74.4	32	74.4
SCL-90 mothers	35	81.4	34	79.1	33	76.7
SCL-90 fathers	30	69.8	28	65.1	26	60.5

\* Only one site performed this task, n=29

**Table 3.** Child mental health according to Conners' questionnaires for parents and teachers.

Instrument	Normal controls mean (SD)	ADHD children	
		0 months mean (SD)	3 months mean (SD)
<b>Conners' parent questionnaire</b>	n = 233 3.3 (3.9)	n = 38 21.3(5.0)***	n = 38 12.5(6.7) <sup>†††</sup>
<b>Conners' teacher questionnaire</b>		n = 26 48.8(15.3)	n = 26 33.9(16.3) <sup>†††</sup>

Controls compared to children with ADHD at zero months (Student's t-test): \*\*\*= p<0.001  
 ADHD zero months compared with ADHD three months (paired Student's t-test): <sup>†††</sup>= p<0.001

**Table 4.** FARS total scores, attribution and enmeshment before and after three months of amphetamine treatment.

FARS-scores:	Normal families		ADHD-families, mothers n = 33		ADHD-families, fathers n = 27	
	Mothers n = 180	Fathers n = 159	0 months	3months	0 months	3 months
	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)
<b>Total score</b>	13.5(11.1)	14.4(10.5)	23.1(13.2)***	19.2(13.3) <sup>†</sup>	24.1(11.4)***	20.9(10.8) <sup>†</sup>
<b>Attribution</b>	1.0(1.5)	0.9(1.4)	3.5(2.0)***	2.5(2.0) <sup>††</sup>	3.6(1.9)***	2.9(1.7) <sup>†</sup>
<b>Interests</b>	2.9(2.7)	2.9(2.5)	3.3(2.7)	3.2(3.0)	3.9(3.0)*	3.2(2.6)
<b>Isolation</b>	1.2(1.7)	1.3(1.9)	2.3(2.1)***	2.0(2.4)	2.1(2.2)*	2.2(1.8)
<b>Chaos</b>	1.7(2.1)	2.0(2.0)	2.9(2.5)*	2.3(2.4)	2.7(2.0)*	2.7(2.3)
<b>Enmeshment</b>	1.8(2.0)	2.3(2.0)	4.2(3.2)***	3.4(2.4) <sup>†</sup>	4.5(2.6)***	3.6(2.2)

Controls compared to families with a child with ADHD at zero months (Student's t-test): \* = p<0.05, \*\* = p<0.01, \*\*\* = p<0.001. ADHD zero months compared with ADHD three months (paired Student's t-test): <sup>†</sup> = p<0.05, <sup>††</sup> = p<0.01