Sleeping problems of children with developmental disabilities are highly prevalent as well as persistent. Such problems can be distinguished as settling difficulties (e.g., prolonged sleep latencies, disruptive behaviors at bedtime, co-sleeping with parents) and waking up frequently during the night or early morning and disturb the parents or siblings (e.g., calling out, crying, co-sleeping). Recent prevalence studies show that the prevalence of sleeping problems among children with biologically determined intellectually handicapping disorders such as Prader-Willi syndrome, Angelman syndrome, Smith-Magenis syndrome, Rett syndrome or autism, is particularly high compared to children without such syndromes. The mechanisms causing phenotypic features like sleeping problems remain for most of the syndromes largely unknown.

Disruptive sleep patterns are of considerable concern for several reasons, the first being the adverse effects on the child. For example, results from a small number of studies indicate that there is a strong correlation between chronic sleeping problems and daytime behavioral difficulties. Next to this, chronic and severe sleeping problems may place enormous stress on the family.

There are several factors that may be related to the emergence and maintenance of sleeping problems in our target group. Medical factors encompass apnea (of central origin or caused by upper airway obstruction), nighttime seizure activity, pain as a result of e.g., otitis media and/or discomfort due to e.g., exzema, asthma or nocturnal enuresis/encopresis. A disordered sleep-waking cycle may be due to visual impairments. Psychological factors include inconsistent bedtime rules of parents and positive reinforcement of abnormal sleeping behavior by parental attention. Sleeping problems may also be related to traumatic events experienced by the child. Finally, factors pertaining to the physical environment may be related to the level of light and noise and opportunities of toy play.

Only a few studies have documented the effectiveness of treatment of chronic sleeping problems of our target group. A number of treatment modalities have been developed and validated. Behavioral procedures encompass (graduated)
extinction, stimulus control, desensitization (fading), and bedtime fading with response cost. Medical treatment include pharmacological approaches (e.g., melatonin, anti-epileptics) and surgery (e.g., tonsillectomy). Recently a procedure called chronotherapy has been described in order to adjust a disordered sleep-waking cycle.

**Controlled case studies**

In our ongoing research project up to now 13 children with syndromal abnormalities and/or multiple handicaps who show also chronic and severe sleeping problems have participated (see References). The results of the treatment with 8 children have been published. Shortterm implementation of behavioral procedures such as extinction and desensitization have been found to be highly effective in establishing a normalized sleep pattern in each child. One child was a six-year-old girl with Wolf-Hirschhorn syndrome (see Curfs et al., in press). She was severely mentally handicapped and had a seizure disorder, which was controlled by anticonvulsive medication. She was referred to the Clinical Genetics Center of Maastricht for analysis and treatment of her longstanding sleeping problems. Since about one year she showed problems in settling as well as frequent nighttime wakings. Her mother would take her out of bed and she was then allowed to lie on a bench in the living room where her mother provided favorite toys and allowed her to watch a videotape. This had a calming effect upon the child and mother would take her to bed again. Usually, she then started to cry again. She showed no signs of fatigue during the day. The process of analysis and treatment encompass a number of distinctive steps. First, interviews are conducted with the child's parents during which information is obtained on medical history, emergence of sleep problems, type and duration of sleep problems as well as antecedents and consequences of the target behaviors. Subsequently, parents are asked to registrate the number of minutes of target behaviors during about seven nights and to describe the circumstances under which the target behaviors occur. During baseline the parents are instructed to continue their usual techniques. Following the baseline phase, hypotheses are generated about the occurrence and maintenance of the sleeping problems and the parents are informed about the results of the functional assessment. Finally, a treatment approach that is based on the hypothesis is presented and parents are asked to carry out the treatment in the home setting. The data are being collected until the end of the follow-up phase.

In our case example the results of the functional assessment suggested that the girl's nighttime disruptive behaviors were reinforced by parental attention. No medical factors, such as eczema, nighttime seizures, or pain were found to be involved. The role of reinforcement in maintaining the target behaviors and the importance of achieving stimulus control with a bedtime ritual was ex-
plained to the mother. An extinction procedure was chosen and the principles as well as possible side-effects of this treatment option were explained to the mother who would carry out the treatment. The mean duration of disruptive behaviors during baseline was 166 minutes and the treatment resulted in a decrease of the number of minutes of disruptive behavior to zero after 35 nights of treatment. The therapeutic effects were maintained during follow-up and thereafter.

**Conclusion**
Children with developmental disabilities do not simply outgrow chronic sleeping problems without treatment. It is our experience that a considerable number of families do not receive appropriate professional help. In our ongoing project, behavioral and/or pharmacological treatment is based upon the results of functional assessment and the (side)effects of treatment are continuously evaluated. Treatment is carried out by parents in the natural setting of the child (mediation therapy). Functional assessment and shorttime treatment may result in a normalized sleep pattern as well as remediation of parental stress. The childrens’ parents in our ongoing research project found the behavioral treatment approach to be safe, very helpful and acceptable.

**References Research Project**


Diurnal characteristics of coagulation and fibrinolysis in exhausted subjects

R. van Diest, PhD. & K. Hamulyák, MD. PhD., CARIM, Maastricht University, The Netherlands.

Introduction
Increased activation of coagulation and decreased fibrinolysis have been forwarded to underly the association between acute myocardial infarction (MI) and chronic psychological stress [1]. Chronic stress ultimately leads to exhaustion [2], a state characterized by fatigue, irritability and poor morale. To describe this fatigue state, the concept Vital Exhaustion (VE) has been developed. VE has been shown to be an independent risk indicator of first MI, and of new cardiac events after coronary angioplasty [3-4]. Impaired sleep and life stressors are important factors in the etiology of VE [5,6], whereas extent of coronary atherosclerosis and left ventricular impairment are only marginally associated with VE [7]. Recent studies have shown that VE is indeed associated with decreased fibrinolysis [8,9], and possibly with an increased coagulation[9]. Normally, these two mechanisms are in balance, such that acute forms of stress usually result in an increased coagulation and increased fibrinolysis [10]. The net effect is an unchanged balance that may be considered to reflect a healthy, adaptive response. A decreased fibrinolysis and an increased coagulation in VE, however, suggest an imbalance that may enhance thrombus formation, thus promoting the risk of MI [10]. Unfortunately, the evidence is based upon a limited assessment of coagulation, and circadian influences were not included. Various measures of coagulation and fibrinolysis, however, exhibit circadian fluctuations that may contribute to the early morning increase of MI [11]. Because the interplay between VE and circadian variation in hemostasis has not yet been investigated, this study tested the hypothesis that VE is characterized by increased coagulation, and decreased fibrinolysis, and examined whether the association between VE and hemostasis is dependent upon the time of day.

Methods
Participants
Questionnaires to screen for VE [12], and current disease status, medication, smoking, and alcohol/coffee were available of 577 males (40-65 yr). Due to various diseases and/or current smoking, 313 subjects were excluded. From the remaining pool, 87 subjects were interviewed to evaluate frequency, sever-