CHAPTER 1

INTRODUCTION

Rationale for the study.

Studying very complex behaviour in psychology is uncommon practice. Many control groups must be selected to deal with all the factors that can contribute to the behaviour. Therefore, for practical reasons, subjects with complex behavioural problems are generally excluded from scientific research. However, clinical practice has to deal with very complex behaviour in spite of the fact that there is a distinct lack of scientific knowledge.

The target group of this thesis includes subjects with complex behavioural problems. This group is institutionalized and has been diagnosed as Mildly Mentally Retarded (MMR) with Attentional Deficit/Hyperactivity Disorder (ADHD) and Conduct Disorder (CD). There is a dearth of scientific research concerning (M)MR in combination with ADHD and CD. As a result of this lack of knowledge, too often mental handicap is being held responsible for behavioural problems.

There are two reasons for mentioning why such children with a mental handicap deserve more attention: 1) the prevalence of ADHD/CD in children with mental retardation is considerably higher (ranging from 9 to 18%) than in children with IQ's in the normal range (3 to 5%) (American Psychiatric Association, 1994, Ando & Yoshimura, 1978; Epstein, Cullinan, & Gadow 1986; Jacobson 1982); 2) it is likely that cognitive problems in cases with a dual diagnosis are more pronounced compared to cases with a single diagnosis (in this case, ADHD and CD children with a normal intelligence).

To discuss in more detail later, there is accumulating evidence that pure MMR is associated with poor attentional abilities, whereas children with a normal IQ but afflicted with externalizing disorders such as ADHD and CD are associated with poor response inhibition. The extent, to which our target-group mirrors the cognitive problems seen in children with a pure diagnosis, is the main theme of this thesis.
Note, this thesis has an exploratory character. It is one of the first experimental studies dealing with a group in which MMR children with comorbid problems play a central role. As it was impossible to select all the necessary control groups to deal with all the variables present in the target group, it was decided to go for a broad approach. Seven selected experiments were carried out in order to explore a number of aspects of neuropsychological functioning in our target group. In each experiment, the MMR group with comorbid disorders will take centre stage and, depending on the research in question, will be compared to MMR children without externalizing disorders and a control group.

Hopefully, the outcome of the studies presented in this thesis, applying an empirical research approach using well-defined experimental paradigms, may lead to recommendations to optimize treatment.

**General description of the target group in this study.**

A paper published by the Dutch Organization for the Handicapped: Form and Colour (de Nederlandse Vereniging voor Gehandicaptenzorg: Vorm en Kleur, 1995) indicated that 450,000 children (two-third are boys) in The Netherlands meet the DSM criteria for MMR. Only 30,000 of this population attend schools for special education. In addition to their low IQ, many MMR children have comorbid behavioural problems. For example, 88 percent of the MMR children who were placed in Dutch institutions in the year 1997 were diagnosed as manifesting externalizing behavioural disorders such as Attention-Deficit/Hyperactivity Disorder, Conduct Disorder, Oppositional Defiant Disorder, Pervasive Developmental Disorder, Borderline or Gilles de la Tourette. The other 12 percent were diagnosed as manifesting internalizing disorders (depression, anxiety disorder).

In the report "Form and Colour" the following statements were made:

1. The number of children with MMR plus behavioural disorders is increasing annually,
2. The behavioural problems of the children with MMR are more complex than in the past,
3. The number of children being placed under the Child Protection Act is increasing. This implies that there are more aggressive and delinquent children being placed in institutions for MMR than in the past.
4. As a result, the treatment period of the institutionalized children has increased. In 1990 the average stay in an institution was 2.6 years, in 1993 the average stay was 3.1 year.
5. As a result, the waiting list for admittance to institutions for these children has increased. At present, a waiting period of two years is not uncommon.

The reason why the number of referrals increases every year and additional behavioural problems of such children are becoming more complex than was the case in the past is unknown. However, whatever the reason, the current situation has led to an enormous pressure on those working on a daily basis with these children, and difficult as it may be, due to the lack of insight into the problematic behaviour, caretakers have to admit that standard care is inadequate for the MMR child with behavioural problems. In other words, there is a lack of scientific knowledge concerning the true nature of the deficits of this target group; consequently caretakers are ill-equipped to react adequately to the special needs of the child with MMR. It is obvious that adequacy of treatment is heavily dependent on the quality of diagnostic and assessment procedures employed to measure the nature of the behavioural deficits. Therefore, the current situation in this field calls for scientific research concentrating on MMR coupled with behavioural problems in childhood.

Characteristics of the target group in this study:

Because of the complexity of the target group, it is difficult to give a completely adequate description. Although diagnosed as MMR + ADHD + CD, the children in this group have many comorbid problems. The children have a long history of care and were admitted because all other treatment had failed. The following characteristics are an attempt to describe the target group, but it cannot be claimed to give the complete picture: mean IQ two standard deviations below the average; verbal IQ in most cases lower than performal IQ; a more structured intelligence test often results in a higher IQ; perceptual functions are relatively well-developed; poor planning, organizational and anticipatory capacities; sequencing problems; memory problems; unclear lateral preference; weak concentration; weak self-regulation; weak self-control; limited social skills; impulsiveness; aggressiveness; coming from stressful (family) backgrounds; and often abused (Geerligs, 1995). As can be seen, there is a mixed set of problems in the target group and most of them were present in the children.
investigated in this thesis. It underlines the complexity of the group and the difficulty in making good diagnoses. Furthermore, it also underlines how difficult it is to create an adequate research design to achieve a scientific understanding of the children.

Subject selection criteria.

The children in this thesis were a sample (n = 30) of institutionalized MMR children with the characteristics mentioned above and diagnosed as MMR with externalizing disorders. Externalizing disorders are defined here as aggressive, antisocial and impulsive behaviour (ADHD and CD). Children with Pervasive Developmental Disorder, Tourette and other psychiatric or neurological disorders, for example, were excluded. Diagnoses were made independently, by means of interviews, by a qualified child psychiatrist and a qualified child psychologist according to DSM (for MMR, ADHD and CD) criteria. Only when the two diagnoses agreed, a child was selected for the experiments. The Child Behavior Check List-Teachers Report Form [CBCL-TRF (Achenbach & Edelbrock, 1983)] was also carried out and the total score for externalizing behaviour disorders had to be within the problematic range in order to qualify. IQ was measured with the WISC-RN test (comprehensive version).

About half of the children in the sample in the target group were receiving medication. In most of the cases this was a low dosage of pipamperon. Pipamperon is registered as an antipsychotic drug. A normal dosage of pipamperon has a mild antipsychotic effect, a strong antiserotonine effect and acts as a mild sedative (Farmaco-therapeutisch kompas, 1996). It is also prescribed in clinical practice for aggressive behaviour in children and it is administered when all other medication has been ineffective. Therefore the drug can be seen as a last-resort drug. In The Netherlands and Belgium it is administered to mentally retarded children with integration disabilities (Gunning, 1994). The exact working mechanisms of the drug are unknown.

A low dosage of pipamperon has no side effects, it does not sedate and has no extrapiramidal effects (motor impairments for example), but can claim to having a positive effect on the behaviour (less aggressive behaviour) of mentally retarded subjects (Van Putten, 1990). Also in low doses, pipamperon is a moderate dopamine-D2-antagonist and a strong serotonine-S2-antagonist (Van Putten, 1990). In every experiment, the effects of the
medication will be evaluated in order to determine whether medication has had an effect on the task variables.

The ideal design for the thesis would have been to take separate groups of children with and without medication, or just one group not on medication, or to study one group before and after medication. However, if only children not receiving medication had been selected, there would have been too few children for the study group with the consequent reduction in the statistical power of the study. Therefore we have chosen for the next best solution, namely checking afterwards what the effects were of medication on the experimental variables.
COGNITIVE STUDIES EXECUTED IN CHILDREN DIAGNOSED AS (M)MR, ADHD AND CD.

Mental Retardation.

Although mental retardation (MR) as such is not the subject of this study, it does form part of the identification of the group. Therefore, it is interesting to discuss cognitive studies concerning MR.

DSM-III-R defines several categories of mental retardation:

♦ Mild mental retardation; IQ 50 - ± 70
♦ Moderate mental retardation; IQ 35-49
♦ Severe mental retardation; IQ 20-34
♦ Profound mental retardation; IQ < 20

The prevalence of MR in the Netherlands is about 2 %, and 70 % of this group belongs to the subgroup mild mental retardation.

The majority of studies with respect to MR (without ADHD or CD) and sustained or selective attention demonstrate that MR has a negative impact on attentional abilities. There are studies suggesting that simple vigilance performance is deficient in children with MR (Jones 1971; Semmel 1965; Crosby 1972). However, in simple vigilance tests older subjects with MR perform the same as normal subjects (Jones 1971; Ware, Baker, & Sipowicz, 1962). If vigilance tasks become more complex, adults with MR often perform poorly compared to adults without MR (Tomporowski, 1990; Tomporowski, Hayden, & Applegate, 1990). Das (1970) reported that subjects with severe MR perform poorly compared to subjects with mild MR on a complex vigilance task.

With respect to selective attention it has been reported that children with MR are less capable of attending to relevant cues in a discriminating learning task than their mental-age-matched peers without MR (Ullman & Routh, 1971). In addition, MR children have more difficulty in remembering information in the presence of distracters (Holowinsky & Farelly, 1988), are easily distracted (Ellis, Woodley-Zanthos, Dunaley, & Palmer, 1989; Ager, 1983;
Follini, Sitkowski, & Stayton 1969), and exhibit a global attention-processing deficit (Merrill & O’dKirk, 1994).

**Mild Mental Retardation.**

A somewhat different picture emerges with respect to MMR as compared to MR. Mosley (1980) compared MMR children (mean IQ = 66) to normal subjects on a selective attention task. His data revealed that under minimal load conditions MMR children were equal to normal controls, however if the load increased the MMR children were less efficient relative to normal controls. MMR may also have a negative impact on vigilance performance (Tomporowsky & Tinsley, 1994; Kirby, Nettelbeck & Bullock, 1978; Kirby, Nettelbeck, & Thomas (1979). That is to say, children with MMR show a more rapid decline in performance as the test duration progresses compared to children without MMR. However, this rapid decline is not found in adults with MMR. Therefore, Kirby et al. (1979) concluded that the performance decrement in the MMR group is largely a developmental problem compared to subjects of normal intelligence. It is tempting to accept this conclusion, but it lacks empirical evidence.

Experimental results from research concerning MMR is slightly different compared to those from studies concerning MR. It is difficult to claim that the difference between MR and MMR is gradual. However, it is also difficult to claim that the difference between MMR and normal controls in cognitive functioning is gradual. What is lacking in this field of research, are studies which use mental retardation as a continuous variable. This is not surprising given the fact that such an experimental design demands careful task and design selection in order to deal with the role intelligence plays.

In conclusion: there is evidence that both MR and MMR are associated with attentional deficits. Within this perspective, one of the questions dealt with in this thesis is whether MMR plus externalizing disorders is also associated with attentional deficits. Chapter 2 is devoted entirely to attentional abilities of the MMR children as compared to normal controls. This topic is also dealt with to a lesser degree in chapter three and four.
Attentional-Deficit/Hyperactivity Disorder.

The prevalence in the Netherlands of ADHD is about 2 to 5 percent. In spite of 40 years of intensive laboratory research it is still a point of debate whether children with ADHD with a normal IQ are afflicted with a selective attention deficit in view of controversial data. However, it is safe to conclude that many of these children do suffer from a sustained-attention deficit (Van der Meere, 1996). Today there is a tendency to shift away from the attention concept towards poor response inhibition. Authorities in this field consider that the key problem is poor response inhibition (for instance Barkley, 1994). Others consider that the poor response inhibition could be explained under the umbrella of poor state regulation (Van der Meere, 1996, 2000).

Conduct Disorder.

CD is characterized by a range of behaviour in which the rights of others and fundamental societal norms are violated. Poor-response inhibition has been described as a core deficit in CD (Loeber, 1990; Farrington, 1993; Newman & Wallice, 1993; Milich, Hartung, Martin, & Haigler, 1994; Quay, 1988a, 1988b, 1993, 1997). Quay has suggested that CD, more specifically undersocialized aggressive conduct disorder, reflects an overactive Behavioural Activation System (BAS), which dominates the Behavioural Inhibition System (BIS). Whereas BAS controls the initiation of behaviour and is sensitive to signals of reward, the BIS inhibits behaviour and is sensitive to signals of punishment. According to Quay, excessive BAS activity causes a strong tendency to respond and interferes with the capacity for response inhibition.

ADHD and comorbid CD.

Using a plethora of studies, it is difficult to disentangle ADHD and CD as far as their impulse control is concerned (Barkley, 1996; Quay, 1988a, 1988b, 1996; Douglas, 1989, Milich et al., 1994; Newman & Wallace, 1993; Pennington & Ozonof, 1996). The prevalence of ADHD with comorbid CD in childhood is considerable. About half of the children under the age of 12 who meet criteria for ADHD, also meet criteria for CD (Pliszka, 1998). In adolescence this rate of CD declines. Here about a third of the children meet criteria for CD.
and ADHD (Pliszka 1998). Hinshaw (1987) summarized results in this area and concluded that ADHD and CD do occur in isolation but very frequently coexist. Taylor (1988) suggests that impulsiveness underlies both ADHD and CD. Oosterlaan, Logan & Sergeant (1998) reported in their meta-analysis of eight studies concerning ADHD, CD and ADHD with comorbid CD that response inhibition deficits did not distinguish children with ADHD, children with CD and children with ADHD + CD from each other.

O’Brien, Halperin, Newcorn, Sharma, Wolf, & Morganstein (1992) investigated the difference between children with ADHD + CD and CD-only using a number of different measurements. They reported that according to academic measurements the ADHD + CD group performed poorly compared to the CD-only group, but according to CPT measurements no difference was found between the ADHD + CD group and the CD-only group. Their data suggests that the core or central deficit of CD and ADHD + CD is impulsiveness.

In sum, impulsiveness or deficits in response inhibition are present in both pure ADHD and pure CD disorders. Therefore, because impulsiveness is associated with externalizing disorders this will be explored in the target group.

**MMR with comorbid externalizing disorders.**

There are a few studies concerning MMR and externalizing disorders.

Pearson, Yaffee, Loveland, & Lewis (1996) conducted a study in which they carried out a sustained-attention task and a selective-attention task with MMR children with and without ADHD symptoms (mean age 10 years; mean IQ =56). For the sustained-attention task they used an adapted version of a CPT test. No differences in sustained attention capacity were found between the group of MMR with ADHD and the MMR group without ADHD. However, the MMR group with ADHD symptoms made four times as many errors of commission, which suggests impulsiveness. For the selective-attention task they used a card-sorting task. The MMR children with ADHD performed poorly on the card-sorting task compared to MMR children without ADHD. Strutt, Anderson, & Well (1975) reported similar findings when using the same card-sorting task.

The CPT used in this experiment was an X-only version. The card-sorting task was a classification task in which the subjects had to sort cards according to features. It is likely that
during this task other mechanisms (i.e. abstract reasoning, internal speech) were also measured.

Handen, McAuliffe, Janosky, Feldman, & Breaux (1998) conducted a study in which they compared three groups of MMR children (aged between 9 and 12 years; mean IQ = 64): a group of MMR children with ADHD, a group of MMR children with ADHD and CD and a group of MMR children without either ADHD or CD symptoms. They used playroom observation and an academic task in their study. During the playroom observation, they reported that MMR + ADHD + CD children as well as MMR + ADHD were more vocal and engaged in a greater number of toy changes than control-group children with MMR-only during independent play. No differences were found between the MMR + ADHD children and MMR + ADHD + CD children. In the restricted academic task, the MMR + ADHD children and the MMR + ADHD + CD showed more off task behaviour compared to the MMR only group. No differences were found between the MMR group with ADHD and the MMR with ADHD and CD.

Melnyk & Das (1992) conducted a study in which they compared a group of MMR children (mean age 14 years; mean IQ = 71) with ADHD symptoms to a group of MMR children without ADHD symptoms. The 13 top and the 13 bottom subjects on the rating scales were categorized as good attenders and poor attenders respectively. The investigators used two types of attention measurement. During a vigilance task (subjects had to detect critical auditory signals imbedded in non-critical auditory signals) they found no differences between the MMR group with ADHD symptoms and a MMR-only group. During the selective-attention task, which was an adapted version of Posner’s physical- and name-matching task, they found that the MMR group with ADHD symptoms performed poorly compared to MMR-only children.

Given the characteristics reviewed in the literature mentioned above, the current thesis confines itself to two important domains of human functioning in our target group, namely attentional abilities and response inhibition.
Flow diagram of the thesis:

Content of chapter 2:
Exploration of a number of attentional abilities:
• Visual scanning strategy;
• Covert shifting of attention (Posner paradigm);
• Divided attention.

As discussed earlier ADHD and CD are not generally related to deficiencies in attention (except sustained attention as mentioned above). However, MMR is. In chapter 2 it will be evaluated if MMR children with externalizing disorders (ADHD + CD) are afflicted with deficiencies in attentional abilities.

Groups:
- MMR + (children with MMR and externalizing disorders)
- Controls

Content of chapter 3
• Impulsiveness.

This chapter is entirely devoted to impulsiveness, which is one of the main characteristics of both ADHD and CD. In the first experiment the concept of impulsiveness will be investigated employing the Continuous Performance Test reconceptualized by Halperin.

The CPT designed by Halperin differentiates between attention errors and impulsiveness errors. The question in this experiment is: do MMR children with externalizing disorders make more attention errors or more impulsiveness errors, or both compared to MMR children without externalizing disorders?

Groups:
- MMR +
- MMR-only
Alertness / arousal task.

In the second experiment the concept of impulsiveness will be investigated using the Alertness arousal task, which is designed to measure the ability to suppress immediate arousal. The task in this experiment will be performed under two conditions: Condition A- where no acoustic signal is used before the target is presented, Condition B- where a warning signal is used before the target is presented. The acoustic warning signal creates arousal.

Groups:
- MMR +
- Controls

Content of chapter 4

• Sustained attention experiment.

It is hypothesized that impulsiveness in ADHD children is associated with a state regulation deficit. That is to say, these children show impulsive behaviour dependent on their behavioural state in which they perform a task. In the first experiment of chapter 4, state has been manipulated, by increasing the duration of the test. Children with ADHD whose intelligence is in the normal range show impulsiveness at the end of the task, not in the beginning (Van der Meere, 1996). Whether this is also the case in our target group is the main question of this chapter.

Groups:
- MMR +
- Controls

• State Regulation experiment.

There is accumulating evidence that impulsiveness in ADHD children is dependent upon the presentation rate of Go-No-Go stimuli. That is to say, impulsive behaviour is most pronounced in these children when the presentation rate is slow. In the second experiment the target group will be compared with MMR children without externalizing disorders and a normal control group.
Groups:
- MMR +
- MMR-only (children with MMR but without externalizing disorders) NB: the MMR+ and MMR-only children are compatible with respect to their IQ, age, etc.)
- Controls

**Content of chapter 5**

- Additional statistical analysis
  A correlation analysis and a factor analysis shall be executed in order to explore tendencies in the way in which our dependent variables are related.

**Content of chapter 6**

General discussion.
REFERENCES.


