SUMMARY

Behavior problems are common in childhood and adolescence. If severe and recurrent, these problems adversely affect the child’s daily functioning (both at home and at school). Moreover, these problems may lead to many negative outcomes in adulthood. It is thus essential to learn more about the etiology, diagnostic trademarks, and treatment of the various types of problem behavior. A growing body of scientific evidence suggests that deficits in aspects of information processing play an important role in this respect. Knowledge in this area is, however, still lacking as to which aspects of information processing are specifically characteristic of the various types (or co-occurring types) of problem behavior. The present dissertation contributes to our understanding of the relationship between information processing and problem behavior in preadolescents.

The studies described in this dissertation are based on data from the first assessment wave of TRAILS (TRacking Adolescents’ Individual Lives Survey). TRAILS is a prospective, Dutch population-based study of 2230 ten- to twelve-year-olds who are measured biennially until into adulthood. During the first assessment wave, multiple aspects of information processing were assessed ranging from capacities that are predominantly involved in perceiving and processing information to capacities that are more involved in responding to information. These information processing capacities were measured by means of reaction time tasks that enable the assessment of even subtle inter-individual differences in the efficiency of information processing. Additionally, multiple types of problem behavior were assessed by standardized questionnaires filled out by parents (96% mothers) and teachers [Chapter 1].

Because previous studies have found the prevalence, development, and manifestation of problem behavior to be associated with the personal characteristics gender, age, intelligence, and socio-economic status, it was first examined in Chapter 2 how these personal characteristics are related to the multiple aspects of information processing. In line with extant literature, only few aspects of information processing
demonstrated a small effect of gender and age. Furthermore, for the vast majority of information processing capacities higher levels of intelligence (IQ) were related to a higher speed as well as a higher level of accuracy of processing. Similar relationships were observed for socio-economic status (SES), yet these SES-related variations in processing turned out to be dependent upon the child's IQ, suggesting that SES is a more distal causal determinant of information processing. The gender-, age-, and intelligence-related variations in information processing were mutually independent. Additionally, no significant interactions between the four demographic characteristics and the information processing measures were found. For studies investigating the relationships between information processing and problem behavior, these findings implicate that gender- and age-related variations in information processing need to be taken into account, even though these effects are small. Furthermore, as long as the theoretical debate about the nature of the covariance between information processing and IQ remains unresolved, these studies may benefit from analyzing their data both with and without controlling for the covariance of IQ.

Subsequently, the relationships between the multiple aspects of information processing and multiple types of problem behavior are explored while accounting for the results of the previous chapter [these studies are described in Chapters 3 through 5]. Chapter 3 reports on a study in which the relationships between information processing and two broad-band categories of problem behavior are examined. On the one hand, internalizing problems which are problems that initially predominantly cause internal distress (i.e., anxious, withdrawn, and depressed behavior) and on the other hand, externalizing problems that initially mainly result in conflict with others (i.e., aggressive and rule-breaking behavior). Apart from showing one type of problems, children can show both types of problems in which case problems are often more severe and chronic. The aim of this study was to identify the aspects of information processing that are mainly related to the severity of the behavior problems in general and the aspects of information processing that distinguish between internalizing and externalizing problems and hence, are more related to the type or direction of problem behavior. Results showed that response variability (i.e., the ability to keep up a stable speed of information processing and responding) and the speed of working memory (i.e., the ability to hold visuo-spatial and
verbal information 'on-line' while comparing it with previously stored information) are mainly related to the severity of problem behavior. However, children with internalizing (and no externalizing) problems did not show any processing deficiencies as compared to children without behavior problems. Furthermore, the speed of inhibiting prepotent responses discriminated between children with only internalizing problems (who were somewhat faster) and children with only externalizing problems (who were somewhat slower). Both groups, however, did not differ significantly from children without behavior problems. These findings suggest that response variability as well as (visuo-spatial and verbal) working memory may be related to the severity of, mainly externalizing, problem behavior, whereas inhibition of prepotent responses may be more related to the direction (internalizing or externalizing type) of broad-band problem behavior.

Because Attention-Deficit/Hyperactivity (ADH) problems frequently co-occur with externalizing problems (Oppositional Defiant/Conduct problems; OD/C), it was subsequently explored in Chapter 4 if these two types of so-called 'disruptive behavior problems' are related to different aspects of information processing. Children with only ADH (and no OD/C) problems and children with both ADH as well as OD/C problems demonstrated deficiencies in specific aspects of information processing. In contrast, children with only OD/C (and no ADH) problems did not show any processing deficiencies. Children with only ADH problems differed from children without behavior problems (no ADH nor OD/C) and from children with only OD/C by showing a lower baseline speed, greater response variability, less efficient visuo-spatial pattern detection, and a less efficient (visuo-spatial and verbal) working memory capacity. They also showed a less efficient performance as compared to children without problems on several other aspects of information processing (e.g., inhibition of prepotent responses), yet these deficiencies were less specific as their performance could not be distinguished from children with OD/C problems. Results indicate that it is the presence of ADH and not OD/C symptomatology that accounts for information processing deficits.

In Chapter 5, the relationships between information processing and Attention-Deficit/Hyperactivity Problems were further examined by comparing the information processing profiles of children with ADH subtype problems, i.e., Inattentive, Hyperactive/Impulsive, and Combined Inattentive and Hyperactive/Impulsive Type
problems. Results showed that children with Inattentive Type problems exhibited a lower baseline speed of processing, greater response variability, and a less efficient working memory as compared to children with no ADH problems and children with Hyperactive/Impulsive Type problems. Children with Combined Type problems showed similar deficiencies as children with Inattentive Type problems. Children with Hyperactive/Impulsive Type problems did not exhibit any deficiencies, not even on inhibition of prepotent responses which might have been expected in light of the nature of their behavior problems. Most pronouncedly, a greater response variability discriminated both the Inattentive and Combined Type from the Hyperactive/Impulsive Type. These findings suggest that symptoms of inattention, rather than of hyperactivity/impulsivity, are related to information processing deficits. These findings do not support distinctive processing deficits in preadolescents with ADH-Inattentive and ADH-Combined type problems and suggest that the ADH-Hyperactive/Impulsive Type may be etiologically different from the Inattentive and Combined Types.

In Chapter 6, the general conclusions are presented and discussed in light of the methodological strengths and limitations of the study and the implications for future research and clinical practice. This dissertation found that, within the general population of preadolescents, inattentive behavior problems are related to specific deficits in information processing. The studies in this dissertation identified four aspects of information processing that were related to parent- and teacher-reports of inattentive problems: i.e., (1) response variability, (2) baseline speed, (3) visuo-spatial and (4) verbal working memory. Of these four aspects, response variability was the most specific as it differentiated children with inattentive behavior symptoms (both with and without co-occurring other problems) from, on the one hand children without behavior problems and on the other hand, children with other than inattentive type problems. This discriminative value, moreover, appeared resistant to statistical control for IQ. No specific deficiencies were found for visuo-spatial pattern detection, responsiveness to auditory feedback, inhibition of prepotent responses, attentional flexibility, perceptual sensitivity, and response bias. Furthermore, this dissertation found no evidence of information processing deficiencies in preadolescents with behavior problems other than inattention, i.e., (only) internalizing, (only) oppositional defiant/
conduct, and (only) hyperactivity/impulsivity problems. These relationships were similar for boys and girls and the influence of age differences was accounted for.

On the basis of these findings, it is concluded that inattentive behavior problems in the general population are best conceptualized as a dimension with different levels of severity. The finding that less severe (i.e., not clinically diagnosed) inattentive type problems are related to deficiencies in specific aspects of information processing indicates that future etiological studies investigating the relationships between information processing and problem behavior need to take these subthreshold inattentive type problems into account. Furthermore, it is argued that baseline speed, response variability, and (visuo-spatial and verbal) working memory may be valuable to future research on the etiology and treatment of problem behavior. These specific aspects of information processing may also be valuable for clinical practice, by providing more objective insights into the specific problems of a child alongside traditional behavioral reports. Finally, it should be noted that the findings of this dissertation are restricted to the narrow developmental period of preadolescence and that future studies are needed to establish whether relationships are similar in childhood and adolescence. As information processing deficiencies can not account for the full phenomenology of problem behavior, it is recommended that these studies examine the relationships more comprehensively by combining neuropsychological and behavioral factors with environmental and biological factors.