SUMMARY

The highly heritable, neurobiological disorder Attention-deficit/hyperactivity disorder (ADHD) is characterized by symptoms of inattention, hyperactivity and/or impulsivity, that cause significant dysfunctioning in important areas of life. ADHD has a childhood onset and often has a chronic course into adulthood.

In the community, ADHD behavior is sometimes regarded as mild and benign. However, Picasso taught us that there is more to people than meets the eye. While each viewpoint reflects a part of the person, it is impossible to recreate the complete synergy of a person or object as a whole. The aim of this thesis is to get more insight into the consequences of living with ADHD. This thesis will take into account four viewpoints on lifestyle in ADHD: the bird’s eye view (nature or neuropsychology of ADHD), the side view (expression of ADHD in the light of comorbidity), the front view (consequences of ADHD on behavior), and the crystal ball view (treatment options for ADHD). In order to study this aim, we used data from the Netherlands Study on Depression and Anxiety (NESDA), an ongoing longitudinal cohort study on the course and consequences of depression and anxiety, and from the PsyQ Department and Expertise Center Adult ADHD, an outpatient specialized mental health care department and clinical research center on adult ADHD.

The birds-eye view: neuropsychology of ADHD

In Chapter 2 the prevalence and predictive value of specific executive functioning deficits were examined in a 6-weeks randomized, placebo-controlled crossover study among 22 adults with ADHD. The results showed that executive functioning deficits were prevalent in 20–60% of patients, depending on which parameter was taken into account. Although executive functioning deficits have shown to be high heterogeneous, this rate is grossly in line with earlier research (40%). In particular parameters measuring attention improved after use of ADHD medication. The parameter reaction time variability was the most sensitive for objectively and subjectively measured effects of ADHD medication, and was also linked to severity of executive functioning deficits, indicating a dose-response relationship.

The importance of the parameter reaction time variability has been marked in earlier studies. This study proposed reaction time variability as an endophenotype for ADHD.
The side view: comorbid depression, anxiety and sleep disorders

Depression and ADHD often co-occur in clinical samples, and severity of depression may be linked to ADHD symptoms. Chapter 3 described the association between severity of depression and comorbidity with ADHD symptoms. A dimensional clinical staging model was used to determine the severity of depression, in which the natural course of a depressive disorder was taken into account. The results showed that persons with a current depressive disorder had a 4.5 times greater odds to report clinical ADHD symptoms, compared to healthy controls, or persons with a remitted depression. Also, persons with clinical ADHD symptoms had more severe depressive symptoms (odds ratio 6.8), and more often had chronic depression (odds ratio 3.8), an earlier onset of depression (odds ratio 1.5), and comorbid anxiety disorders (odds ratio 3.4). Additionally, the prevalence of ADHD symptoms was significantly related to the developmental phase of depression: the more severe the depression, the higher the prevalence of ADHD symptoms. More than 20% of persons with chronic depression had clinically relevant ADHD symptoms.

The causality in the relationship between depression and ADHD is unknown. Depression and ADHD have overlaps in underlying genetic alterations, depression may mimic ADHD symptoms, or undiscovered ADHD may result in depressive symptoms. Considering ADHD may be an important step in treatment for severe depression.

In Chapter 4, the potential comorbidity of ADHD symptoms in persons with depressive and/or anxiety disorders was studied in relationship to circadian rhythm sleep problems. The results of this study showed that comorbid ADHD symptoms in depressive and/or anxiety disorders had a 2.4 to 2.7 increased odds ratio for all three parameters of circadian rhythm sleep disorders: extremely late evening type, delayed sleep phase syndrome, and short sleep on nights before work days. Especially problems with inattention, and not hyperactivity/impulsivity problems, are associated with circadian rhythm disturbances. Comorbid ADHD symptoms added to the risk of a disturbed circadian rhythm, independent from the known risk of depression and anxiety on circadian rhythmicity. Considering the long-term consequences of circadian rhythm disturbances on health, adequate treatment of such sleep problems is needed and may include detection and treatment of ADHD in persons with depression and anxiety.
The front view: behavior of ADHD

In Chapter 5 the short (two-weeks) and long term (three-months) effects of methylphenidate use on tobacco consumption and nicotine craving were investigated among 325 adults with ADHD. The results showed that more than half of the adults with ADHD smoked, in contrast to 26% of the general population. After two weeks as well as after three months of using methylphenidate for ADHD symptoms, patients reported an increase in the number of consumed tobacco units (daily increase of 1.3 cigarettes) and increased nicotine consumption. In other words, patients not only smoked more cigarettes, they also experienced more craving (20-29%) and smoked heavier. Especially the group of light smokers, who smoked 1-12 cigarettes per day, showed an increase in consumption after methylphenidate use. In addition, the negative effect of methylphenidate on smoking appeared to stabilize over time, showing less variance at the three-months measurement compared to the two-weeks measurement.

Although methylphenidate is one of the pharmacological treatments of first choice in adults with ADHD, the effects on smoking behavior and craving should be taken into account, and possibly actively prevented in this patient group.

In Chapter 6 we examined risk factors for adverse driving outcomes and unsafe driving behavior among 330 adults with ADHD and 330 controls. Adults with ADHD had significantly more adverse driving outcomes, including an 2.7 increased odds for three or more vehicular crashes. Driving frequency, male gender, age, high anxiety levels, high hostility levels, and alcohol use all significantly influenced the odds or unsafe driving behavior, for having had 12 or more traffic citations, and/or for having had 3 or more vehicular crashes. On most measures other factors than having an ADHD diagnosis constituted a larger risk factor for unsafe driving. Although alcohol use, and high levels of anxiety and hostility are highly prevalent in ADHD, and mediated the risk for negative driving outcomes, they are non-specific to ADHD and may also be found in the general population. The presumed risk of an ADHD diagnosis alone may deserve some revision.

Discussion

Although symptoms of inattention, hyperactivity and impulsivity may appear mild in adults with ADHD, the consequences of living with ADHD seem underestimated. This thesis showed that executive functioning is impaired
in most cases, which may influence driving abilities. Moreover, comorbid disorders such as depression and circadian sleep problems are highly prevalent in ADHD. Despite promising effects of methylphenidate, as one of the pharmacological treatments of first choice on the core symptoms in ADHD, side effects concerning increased smoking and nicotine craving deserve further investigation. Furthermore, we hope that a more Picasso-like view on ADHD may help to reduce the stigma on ADHD.