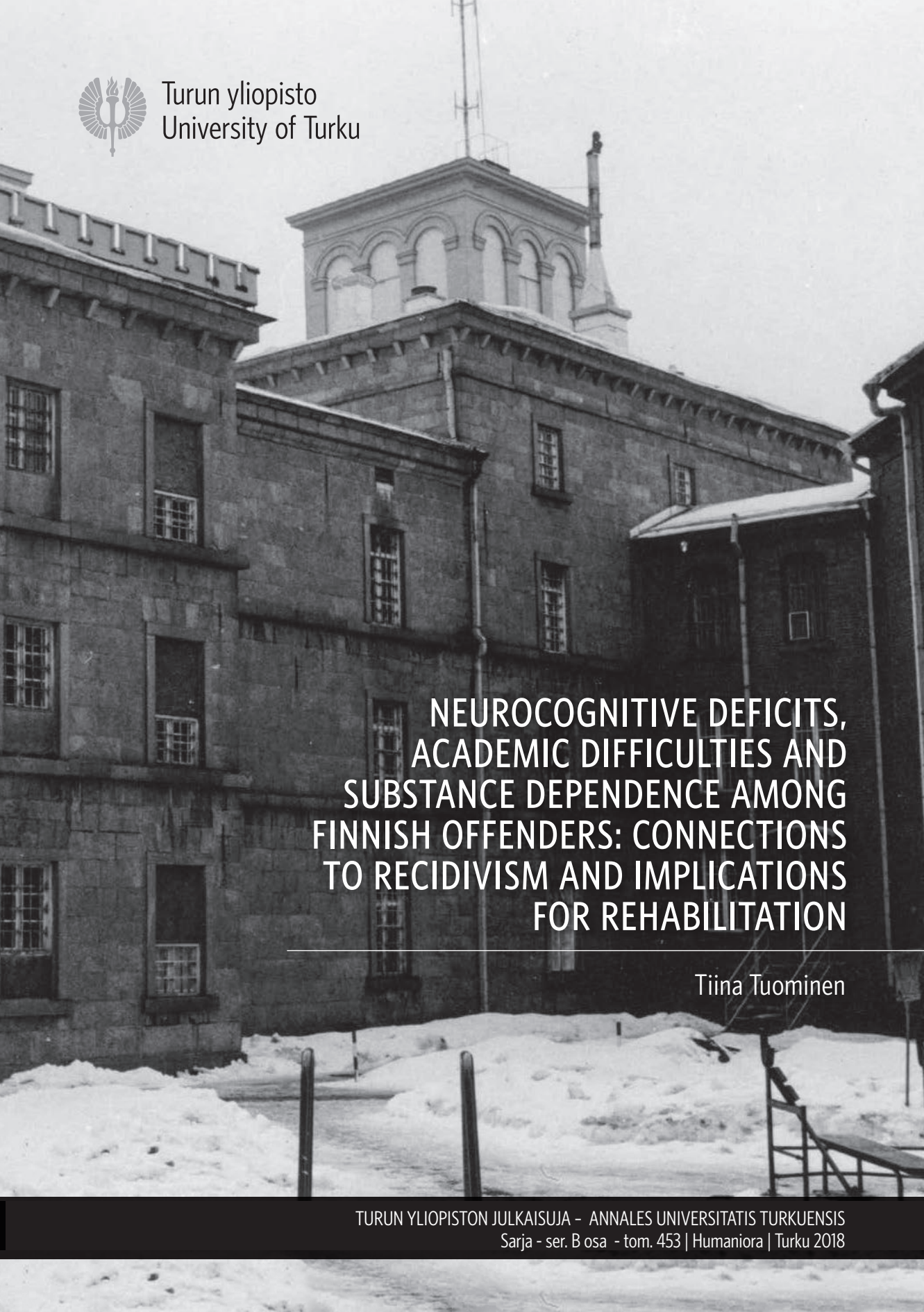




Turun yliopisto
University of Turku



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ACADEMIC DIFFICULTIES AND
SUBSTANCE DEPENDENCE AMONG
FINNISH OFFENDERS: CONNECTIONS
TO RECIDIVISM AND IMPLICATIONS
FOR REHABILITATION**

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To Eemeli and Anna

ABSTRACT

Neurocognitive and academic deficits are frequent among male offenders and the prevalence of these disorders is known to be higher than in the general population. Also psychiatric disorders and substance dependence are overrepresented among offenders. Neurocognitive and academic deficits, psychiatric disorders and substance dependence are all known to be risk factors for offending and a criminal career. Studies on recidivism have mainly focused on the associations between ADHD (Attention Deficit Hyperactivity Disorder), psychiatric disorders, and violent crime, but have ignored connections to various psychiatric disorders and neurocognitive deficits and academic difficulties. The aim of this thesis is to examine the neurocognitive and academic performance in a sample of sentenced male prisoners in Finland. The frequency of reading, spelling, and mathematical difficulties was also analyzed. I also examined how neurocognitive deficits and academic difficulties are associated with psychiatric diagnoses, especially with substance dependence. If a specific profile of neurocognitive, academic and psychiatric factors among offenders could be found that is related to recidivism and criminal career, this could be more effectively targeted by intervention procedures. In a health survey of Finnish prisoners, 72 sentenced male prisoners were examined in Turku prison using a neurocognitive test battery and psychiatric assessment including a standardized psychiatric interview (SCID-I, II). First, a range of neurocognitive deficits was common, especially in motor dexterity, visual construction, verbal comprehension, verbal and visual memory, and shifting attention. Furthermore, recidivist men had problems indicating impulsivity. Second, the comprehensive neurocognitive deficits and illiteracy problems seemed to go together among prisoners. The results showed a high number of reading and spelling difficulties. Fifteen percent of those with medium to severe problems in academic skills had marked difficulties in mathematics. Third, major mental disorders (Axis I diagnosis) and substance dependence were connected with neurocognitive and academic deficits. Moreover, first-time offenders had fewer neurocognitive deficits and Axis I disorders, less substance dependence and fewer personality disorders than those with several convictions. Fourth, the combination of neurocognitive deficits and substance dependence was connected to recidivism. According to the thesis, the Finnish male offender could be described using four groups with different characteristics of neurocognitive, academic and psychiatric factors. Preventing the development of substance dependence, together with rehabilitation of neurocognitive deficits, seems to be important for reducing recidivism. We suggest that both selection and preparation for participation in offender programs might be more effective if specific neurocognitive deficits are identified and efforts first made to ameliorate them.

TIIVISTELMÄ

Neurokognitiiviset häiriöt sekä lukemisen, kirjoittamisen ja matematiikan vaikeudet ovat yleisiä vangeilla ja näiden ongelmien esiintyvyys on suurempaa kuin yleisväestössä. Vangit kärsivät myös psykiatrisista häiriöistä ja päihderiippuvuudesta yleisväestöä enemmän. Neurokognitiiviset häiriöt, lukemisen, kirjoittamisen ja matematiikan vaikeudet sekä psykiatriset häiriöt ja päihderiippuvuus ovat tutkimusten mukaan riskitekijöitä rikolliselle käyttäytymiselle ja vankilaan joutumiselle. Rikoksen uusimista käsittelevissä tutkimuksissa on usein keskitytty yhteyksiin ADHD:n (keskittymisen ja tarkkaavuuden häiriö) ja muiden neuropsykiatristen ja psykiatristen häiriöiden sekä väkivaltarikollisuuden välillä. Muut psykiatriset häiriöt ja erityisesti niiden yhteydet neurokognitiivisiin ja lukemisen, kirjoittamisen ja matematiikan vaikeuksiin on jätetty vähemmälle huomiolle. Tässä väitöskirjassa tarkastellaan suomalaisten miesvankien neurokognitiivista suoriutumista, lukemisen, kirjoittamisen ja matematiikan ongelmia sekä niiden yhteyksiä psykiatrisiin häiriöihin. Tässä tutkimuksessa oli tavoitteena selvittää, miten neurokognitiiviset sekä lukemisen, kirjoittamisen ja matematiikan häiriöt ovat yhteydessä psykiatrisiin diagnooseihin, erityisesti päihderiippuvuuteen. Tarkoituksena on pyrkiä löytämään mahdollisia ongelmaprofiileja, jotka voisivat auttaa tarkoituksenmukaisten ja toimivien kuntoutusohjelmien suunnittelussa ja toteuttamisessa vangeille. Turun vankilasta kerättyä aineistoa varten tutkittiin neuropsykologisilla testimenetelmillä 72 miespuolista vankeusvankia. Aineisto liittyi laajempaan Suomessa tehtyyn vankien terveystutkimukseen. Psykiatrinen arvio suoritettiin käyttäen standardoitua psykiatrista haastattelua (SCID-I,II). Ensimmäiseksi, vangeilla oli yleisesti laaja-alaisia neurokognitiivisia häiriöitä, erityisesti hienomotoriikassa, visuaalisessa hahmottamisessa, kielellisessä ymmärtämisessä, visuaalisessa sekä kielellisessä muistissa sekä tarkkaavuuden siirtämisessä. Rikoksen uusijoilla oli taipumusta impulsiiviseen reagointiin. Toiseksi, neurokognitiiviset häiriöt ja lukemisen, kirjoittamisen ja matematiikan ongelmat näyttivät olevan yhteydessä toisiinsa. Lukemisen ja kirjoittamisen ongelmat olivat vangeilla yleisiä. Viisitoista prosenttia niistä vangeista, joilla oli keskivakavia tai vakavia ongelmia lukemisessa ja kirjoittamisessa, oli myös merkittäviä vaikeuksia matematiikassa. Kolmanneksi, vakava mielenterveyden häiriö (Axis I) ja päihderiippuvuus olivat yhteydessä neurokognitiivisiin sekä lukemisen ja kirjoittamisen häiriöihin. Ensimmäistä vankeustuomiota suorittavilla vangeilla oli vähemmän neurokognitiivisia häiriöitä, vakavia mielenterveyden häiriöitä, päihderiippuvuutta ja persoonallisuushäiriöitä kuin moninkertaisilla tuomion uusijoilla. Neljänneksi, neurokognitiiviset häiriöt yhdessä päihderiippuvuuden kanssa olivat eniten yhteydessä uusintarikollisuuteen. Tämän väitöskirjan tulosten perusteella Suomalaisia miesvankeja voidaan kuvata neljänä erillisenä ongelmaryhmänä liittyen neurokognitiivisiin häiriöihin, lukemisen, kirjoittamisen ja matematiikan ongelmiin sekä psykiatrisiin häiriöihin. Päihderiippuvuuden ehkäisy sekä neurokognitiivisten ja lukemisen, kirjoittamisen ja matematiikan taitopuutosten harjoittaminen ja kuntoutus ovat tulosten valossa tärkeitä tekijöitä uusintarikollisuuden ehkäisyssä. Tulosten perusteella voidaan suositella, että vankien neurokognitiivisia, sekä lukemisen, kirjoittamisen ja matematiikan puutoksia arvioidaan ja kuntoutetaan jo ennen vangin ohjaamista laaja-alaisempiin käytössä oleviin kuntoutusohjelmiin. Tämä saattaa edesauttaa sijoittumista sopivaan kuntoutusohjelmaan sekä tehostaa vangin hyötymistä kuntoutuksesta.

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- II Tuominen, T., Korhonen, T., Hämäläinen, H., Temonen, S., Salo, H., Katajisto, J., & Lauerma, H. (2014b). Functional illiteracy and neurocognitive deficits among male prisoners: Implications for rehabilitation. *Journal of Forensic Practice*, 16, 268-280, doi: 10.1108/JFP-10-2013-0044.
- III Tuominen, T., Korhonen, T., Hämäläinen, H., Katajisto, J., Vartiainen, H., Joukamaa, M., Lintonen, T., Wuolijoki, T., Jüriloo, A., & Lauerma, H. (2017). The factors associated with criminal recidivism in Finnish male offenders: Importance of neurocognitive deficits and substance dependence. *Scandinavian Studies in Criminology and Crime Prevention*, doi: 10.1080/14043858.2017.1305037.

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1. INTRODUCTION

Understanding factors behind offending and criminal behavior is important if we want to evaluate risk for recidivism or to set goals and select the appropriate means for rehabilitation. In Finland over a half of all those released return to prison, and a year after release the share of recidivist is increasing (Hypén, 2004). Also from the economic point of view, it is important to elicit different individual factors that may maintain criminal behavior or negatively affect offenders in rehabilitation since the crimes carry a great burden. Mental disorders are over-represented among prisoners (Fazel et al., 2016). As are also the prevalence of neurocognitive deficits (Meijers et al., 2015) and academic disorders such as reading and spelling difficulties (Svensson, Lundberg, & Jacobson, 2001), and arithmetic problems (Greiffenstein & Baker, 2002) over-represented. Impaired neurocognitive function may be of particular importance to offender rehabilitation.

In this thesis we investigated the neurocognitive performance among Finnish male offenders. By wider use of neurocognitive assessments it is possible to evaluate how different neurocognitive functions, for example, attentiveness, working memory, motor dexterity and visual construction are connected with academic difficulties and psychiatric disorders. Second, although, we used a large neuropsychological test battery to make a diagnostic evaluation of attentiveness, the behavioral evaluation is also important to make a proper diagnosis of ADHD. Such an assessment was not practicable in this study.

In addition to neurocognitive deficits, we also focused on academic difficulties as we know that neurocognitive deficits and reading, writing and arithmetic difficulties often go together. We preferred to use the terms academic skills or academic difficulties to describe reading and spelling deficits, rather than using the terms dyslexia or learning disorders. We were interested in different types of reading and writing problems which may also be called functional illiteracy. Functional illiteracy can be defined as the inability to acquire basic reading, writing, and arithmetic skills despite the compulsory years in education and the affect this has on their functioning in daily life (Vágvölgyi, Coldea, Dresler, Schrader, & Nuerk, 2016). In addition to these language-related problems, the concern has been expanded in this study to also include mathematical difficulties. Accordingly, we evaluated the

prevalence of neurocognitive and academic difficulties in order to identify areas for intervention and rehabilitation. To understand the broader picture of psychological and psychiatric condition of offenders we also included the psychiatric diagnoses and socioeconomic background factors as we know that there is also comorbidity among these factors, some of which are known to be risk factors for recidivism.

1.1 Quality and prevalence of neurocognitive deficits and academic difficulties among offenders

There is an established literature indicating that impaired cognitive functioning is implicated in offending (Farrington, 1992; Moffitt, 1993; Raine et al., 2005). Moffitt (1993), in a prospective birth cohort study, found two distinct offender groups: adolescent-limited and life-course-persistent delinquents. The life-course-persistent group was characterised by early developmental neuropsychological difficulties (Moffitt, 2003). More specifically, she found that verbal regulation and behavioral control were the key deficits among delinquents (Moffitt, 1990; Moffitt et al., 1994). The importance of specific neurocognitive deficits is also supported by the fact that non-criminal adults who have these deficits are at a greater risk of psychosocial problems than adults without them (Torgersen et al., 2006).

Neurocognitive functioning is a broad term which encompasses different areas of comprehensive cognitive functions such as verbal and visual comprehension, visual-constructional and spatial abilities, motor dexterity, processing speed (time to respond to a task), memory, and areas of attention (Lezak et al., 2004). Some researchers emphasize generalized cognitive impairment among offenders (Marceau et al., 2008), but there are also results concerning specific areas of neurocognitive functioning. Studies suggest that offenders have problems in shifting attention (Baker & Ireland, 2007), in working memory and in sustaining attention (Kavanagh, Rowe, Hersch, Barnett, & Reznik, 2010) compared to non-offenders. There are also studies which have found differences in neurocognitive functioning between violent and non-violent offenders. It has been found that violent offenders show poorer inhibition (Meijers et al., 2017) and set shifting (Hancock, Tapscott, & Hoaken, 2010) compared to non-violent offenders. Some other studies, however, did not find any differences between these offender categories (Hoaken, et al., 2007; Greenfield & Valliant, 2007).

Estimates of the prevalence of neurocognitive deficits among offenders vary widely due to the definitions used and the range of measures used to assess them (Fazel, Xenitidis, & Powell, 2008). Overall, according to a recent review (Meijers, Harte, Jonker, & Meynen, 2015), there are various cognitive function impairments in prisoners. ADHD is a common and disabling disorder with neurocognitive deficits among offenders. It is therefore widely studied among prisoners. ADHD may be present among approximately 40% of adult male prison inmates (Ginsberg, Hirvikoski, & Lindefors, 2010; Rasmussen, Almvik, & Levander, 2001). However, in many studies, only self-reports are used, and so different neuropsychological domains and profiles may be missed. In this thesis, the different neurocognitive profiles among offenders according to different neurocognitive domains and symptoms were evaluated.

In recent years, several studies have examined the prevalence of reading difficulties among offenders and found it to be much higher than in the general population (Alm & Anderson, 1997; Dalteg et al., 1997; Snowling, Adams, Bowyer-Crane & Tobin, 2000). As many as two thirds of offenders have been found to suffer from some reading and spelling difficulties (Alm & Anderson, 1997; Lindgren et al., 2002; Samuelsson, Herkner, & Lundberg, 2003; Svensson, Lundberg, & Jacobson, 2003; Svensson, Fålh, & Persson, 2015) but Svensson, Lundberg and Jacobson (2001) reported that even 70% of Swedish delinquents have problems with reading or spelling. The majority of studies concerning learning disabilities in adults utilize a framework of dyslexia that manifests primarily as a difficulty in reading and spelling, with a core deficit in phonological processing (e.g. Gregory, 2004; Snowling, 2001; Stanovich, 2000; Vellutino, Fletcher, Snowling, & Scanlon, 2004). However, reading and writing difficulties may be caused by a large number of factors outside phonological processes. Literacy problems may also involve so-called functional illiteracy which is caused not only by core deficits such as phonological problems, but can be seen as incapability to understand complex texts despite adequate education. Dyslexics and functional illiterates may represent separate groups of reading disabilities (Vágvölgyi, Coldea, Dresler, Schrader, & Nuerk, 2016). Mathematical skills are also of importance to manage daily life. Mathematical skills include operations to calculate numbers, time and distance. It is an important skill for handling money and in making decisions in the fields of science, technology, engineering and math, but also in everyday life (Neelkamal, Evans, & Patel, 2018).

Individuals with arithmetic difficulties have impairment in underlying cognitive processes. These deficits appear to be related to difficulties in attention, working memory, and visuospatial skills (Geary, 2004; Neelkamal, Evans, & Patel, 2018). Mathematical skills are, however, less studied among offenders than reading or writing abilities and therefore more information is needed. In the study of Kenny et al., (2006), of offenders serving community orders in Australia, 64% had arithmetic problems. According to a more recent study of 10-18-year-old detained juveniles (Lansing et al., 2014), more than half scored below the 10th percentile on arithmetic.

1.2 The comorbidity between the neurocognitive deficits and academic difficulties

Poor readers seem to have deficits in neurocognitive functions (Brosnan et al., 2002; Baker & Ireland, 2007). Earlier studies have shown that dyslexics have problems in planning abilities (Weyandt, Rice, Linterman, Mitzlaff, & Emert, 1998), working memory (Jeffries & Everatt, 2004; Wijsman et al., 2000; Willcutt et al., 2001), and both set shifting and organization (Närhi, Räsänen, Metsäpelto, & Ahonen, 1997). Typically, factors associated with reading difficulties are phonological deficits (Melby-Lervag, Lyster, & Hulme, 2012) and, working memory, especially verbal memory problems (Moll, et al., 2016). In some studies, 30% of ADHD adults have been diagnosed with learning disabilities (Barkley, 1998; Spencer et al., 1999). This comorbidity is found to be more evident in reading and the inattention subtype than in reading and the hyperactivity/impulsivity subtype of ADHD (DuPaul & Volpe, 2009; Zumberge, Baker, & Manis, 2007). Adults with ADHD have been found to perform poorly in spelling, mathematics, and comprehension tests (Barkley, 2008). It is possible that inattentiveness might interfere with reading acquisition, which in turn might cause problems with reading comprehension (Rasmussen et al., 2001).

The literature suggest that there is comorbidity of arithmetic and reading difficulties (Moll, Göbel, & Snowling, 2015; Raddatz, Kuhn, Holling, Moll, & Dobel, 2017). Greiffenstein and Baker (2002) found that arithmetic deficiency in a normal adult sample was related to low nonverbal intelligence, visuoconstructional problems, and difficulties in switching mental set as measured by the Wisconsin Card Sorting Test. It is also possible that mathematical learning difficulties is a very heterogeneous disorder in terms of the neurocognitive deficits behind it (Bartelet,

Ansari, Vaessen, & Blomert, 2014). Correlates between arithmetic difficulties and neurocognitive deficits among offenders have been much less widely studied.

1.3 Mental disorders among offenders

In a large-scale systematic review of severe mental disorders among offenders in western countries, Fazel and Danesh (2002) found that one in seven prisoners had either a psychotic illness or major depression. Moreover, a review of Collins et al. (2010) revealed a mean prevalence of any psychiatric disorder among incarcerated adolescents of almost 70%. There is indeed a high prevalence of severe mental disorders called Axis I disorders (Fazel & Seewald, 2012; Kavanagh, Rowe, Hersch, Barnett, & Reznik, 2010; Joukamaa et al., 2010), personality disorders (Joukamaa et al., 2010) and substance and alcohol dependence (Fazel, Hayes, Bartellas, Clerici, & Trestman, 2016; Lintonen et al., 2012) among offenders. According to the latest review (Fazel, Hayes, Bartellas, Clerici, & Trestman, 2016), there are high rates of depression and substance misuse among prisoners. Rates of psychiatric comorbidity are also higher among prisoners than in the general population (Fazel & Seewald, 2012; Parsons et al., 2001). ADHD is one of the most frequently diagnosed mental disorders of youth and adult prison populations. According to a meta-analysis of international studies, 30% and 26% of the youth and adult prison populations, respectively, had diagnosed ADHD (Young et al., 2014; Young et al., 2015). A higher prevalence, such as 40 %, has also been suggested (Ginsberg et al., 2010). It also appears that the risk of comorbid mental disorders may be greater among offenders with ADHD than among offenders without it (Gudjonsson, Wells, & Young, 2012). For example, youth offenders with ADHD were three times more likely to have an affective disorder compared to offenders without ADHD (Young et al., 2015). Over 80% of those with ADHD had at least one psychiatric disorder, and more than 50% had two other disorders (Barkley, Murphy, & Fischer, 2008).

1.4 What do we know about recidivism due to neurocognitive or mental disorders?

In addition to the high prevalence of disorders among offenders, psychiatric disorders have been found to be associated with increased risk of violent offending (Chang, Larson, Lichtenstein, & Fazel, 2015) or recidivism in general (Mulder,

Brand, Bullens, & van Marle, 2010). Substance use disorders and personality disorders are definitely risk factors for criminal and violent recidivism (Elonheimo et al., 2007; Falk et al., 2013). In the Finnish birth cohort study of Elonheimo et al., 2007, those with psychiatric disorders (10 %) accounted for 49% of all crimes. A substance abuse problem makes the scenario even worse (Colins et al., 2013; Elonheimo et al., 2007); substance abusers with co-occurring mental disorders are more likely to be arrested and incarcerated than those without mental disorders (Monahan, 1992). Studies on recidivism have mainly focused on the associations between ADHD and psychiatric disorders, such as psychopathy and schizophrenia, and violent crime (Fazel, et al., 2009; Ginsberg, Hirvikoski, & Lindefors, 2010; Lindberg, et al., 2009), but have ignored connections to various psychiatric disorders and neurocognitive deficits and academic difficulties. According to a study by Koenen, Caspi, Moffitt, Rijdsdijk and Taylor (2006), there is an association between low IQ and antisocial behavior. It has also been claimed that low verbal IQ combined with family adversity increases the odds of early onset of offending (Gibson, Piquero, & Tibbets, 2001). There has been consensus regarding connections between reading difficulties and recidivism (Katsiyannis, Ryan, Zhang, & Spann, 2008; Rucklidge, McLean, & Bateup, 2009; Zhang, Barrett, Katsiyannis, & Yoon, 2011), but it is also quite common to have attentional problems comorbidly with reading difficulties (Dåderman, Lindgren, & Lindberg, 2004). It has been suggested that ADHD may have a role in recidivism (Colins et al., 2011; Ginsberg, Hirvikoski, & Lindefors, 2010; see Wibbelink et al., 2017), mainly because of the impulsiveness and attention deficits inherent in it. Research in the area of neurocognitive functions in psychiatric disorders has revealed a deterioration in several cognitive domains including executive function, information processing, and attention (Kavanagh et al., 2010). The comorbidity between psychiatric disorders and neurocognitive and academic deficits may not only make the cases more complex but can also play an important role in maintenance of recidivism. However, the interaction between these factors and psychiatric disorders and their association with recidivism needs more attention.

1.5 Can we improve the commitment to the rehabilitation?

In the correctional literature (see review of Holdsworth, Bowen, Brown, & Howat, 2014), psychosocial factors (e. g. impulsivity and criminal attitudes) and psychiatric disorders seem to predict treatment engagement, which means the offender's ability

to learn from a rehabilitative intervention. The Risk Need Responsivity principle (RNR; Andrews, Bonta, & Wormith, 2011) suggests that addressing criminogenic factors such as antisocial personality pattern and substance abuse, and matching treatment to the cognitive abilities will improve outcomes. However, RNR does not particularize the cognitive abilities as neurocognitive or academic skills. Cognitive deficits may indeed impair offenders' ability to respond to a correctional program (Fishbein et al., 2009).

Sentenced prisoners are generally expected to take part in an accredited program related to their offending, indeed for some under indefinite sentences (a life sentence), their release may partly depend on this. These programs, however, rarely take account of or offer training in executive or other neurocognitive skills. In the cognitive skills program (Ross et al, 1986), widely used in the prisons of Nordic countries, offenders learn about the influence of thinking on their behavior and emotions, and they are helped to develop better problem-solving and interpersonal skills, but even this program does not focus on management of or coping with neurocognitive deficits. It would be important to train fundamental neuropsychological and academic functions before implementing general intervention program, like a cognitive skills rehabilitation program which enhances social interaction skills. According to the review of Uttal et al., (2013), there are promising results concerning training spatial skills. Improvements in spatial skills may also emerge as improved working memory and attention as they are parts of the mental rotation mechanism (for example the amount of information that can be thought about and acted on. Some executive functions can be strengthened by training and focused interventions (for example, computerized working memory training tasks such as delay discounting and letter sequencing test) but future studies are needed because of their questionable effectiveness (Bickel et al., 2015).

2. AIMS OF THE STUDY

The main aim of this thesis was to examine the neurocognitive deficits, academic difficulties and psychiatric disorders and their combinations among Finnish male offenders in order to identify areas for intervention and rehabilitation. We aimed to find out how different profiles of neurocognitive and academic deficits and psychiatric disorders (including substance dependence) are associated with criminal recidivism and prison career among male offenders.

The specific questions were:

1. What is the frequency of neurocognitive deficits and reading, spelling, and mathematical difficulties among Finnish male offenders? (Studies I and II)
2. Are there distinct neurocognitive profiles among offenders that could be used to guide the planning of more appropriate rehabilitation programs? (Study I)
3. How are neurocognitive deficits and academic difficulties associated with psychiatric diagnoses, especially with substance dependence? (Study III)
4. Are there specific profiles of neurocognitive and psychiatric factors among offenders that are related to recidivism and could be a target for intervention procedures? (Study III)

3. METHODS

3.1 Participants

Seventy-eight offenders (aged 19-61) participated in this study at the Prison of South Western Finland (current name: Turku Prison). The majority of the data was obtained between 2005 and 2007 (The psychiatric evaluation process was carried out mainly in 2007). The mean age of the entire group was 32.2 years ($SD=9.1$, range: 19-61). The participants were also taking part in an on-going Finnish study of prisoners' health (The Health, Working Capacity, and Health Care Needs of the Clients of the Criminal Sanctions Field), which is supported by the Finnish Criminal Sanctions Agency. The participants were all serving a prison sentence at the time of the study, and they were randomly selected from the prison population. The study sample included neither prisoners on remand nor fine default prisoners. The participants were willing to co-operate, although the process of assessment was rather demanding. Originally, 100 participants were screened for inclusion in the study. Ten were excluded from the study on the grounds of total non-compliance. Eleven participants were transferred to another prison (due to relocation to another prison, for example, to the open prison at the final stage of the sentence) or were released during the study. Four participants were excluded because of their very limited intellectual abilities (WAIS-III IQ under 70), and three because of incomplete test results. Seventy-two participants completed all the reading, writing, spelling and arithmetic tests, and they comprised the final study group. The demographic data are given in Table 1. Nearly all (91.8%) of the participants had completed nine years of compulsory school, and 49.3% of the participants had also completed some form of post-compulsory vocational training; thus 50.7% had no further education. According to the national statistics for the Finnish population, 18.6% of the total adult population have completed no more than the compulsory nine-year schooling. [ages 7-16, usually (if misleadingly) referred to in official Finnish documents in English as the 'comprehensive school' (Statistics Finland, 2008)]. All the participants had Finnish as their mother tongue. The term 'principal offence' refers to the offence for which the longest sentence had been imposed. The forensic data are given in Table 1. According to the Finnish Prison Administration (Criminal Sanctions Agency, 2006), the principal offences of male prisoners on May 1st 2006 were crimes of violence, homicide, drug offences, theft, and drunken driving. The study sample

corresponded relatively well to this distribution (Table 1). The number of prisoners serving a sentence in Finland is 0.7/1000 inhabitants over 15 years of age, which is close to the European average. In the Finnish sanctions system there is no death penalty.

Table 1. Demographic Features and Forensic Data (n = 72)

	Mean	SD	%	Range	Finnish prison population % ¹
Age (years)	32.2	9.1		19-61	
Education (years)	9.7	1.6		4-15	
Number of previous convictions	4.4	3.6		0-18	
Age at first conviction	23.7	7.5			
Duration of incarceration (months)	37.6	40.2			
First time in prison			18.2		24.7
Eight or more previous convictions			30.1		15.0
Homicide			19.2		18.8
Other violent crimes			19.2		20.1
Robbery			3.8		6.8
Theft			20.5		14.8
Drunken driving			19.2		12.2
Drug offences			8.9		15.2

Note. ¹ Source: the Criminal Sanctions Agency, 2006.

Recidivism was defined as the number of prison convictions for any offence before the ongoing sentence. A recidivist offender is seen retrospectively as one who has repeated prison convictions. We classified the number of previous convictions into two categories: one or more and four or more previous convictions. Information about the sentence and previous convictions has been collected from the prisoner information database (VaTi; Vankitietojärjestelmä), an administrative database comprising all measures planned and taken during a sentence. This official register was used to gather information connected to the sentences, such as the beginning dates of the imprisonment, the release dates, and the sentence lengths.

3.2 Procedure

Assessments were conducted by two psychology masters' degree students, trained in the neuropsychological testing procedure by the first author. Some tests were given

in a group situation (The Rey-Osterrieth Complex Figure test, Rey & Osterrieth, 1993; The screening test for reading, reading comprehension and spelling for the young and adults, Holopainen, et al., 2004; The Test for Arithmetic, Räsänen & Leino, 2005) and others individually. All tests were conducted in Finnish. The whole assessment took approximately two hours. Participants could take a short break, as needed. The data collection period was about 10 months.

3.3 Measures

To assess neurocognitive deficits, the test battery used included measures of general intelligence, verbal and visual comprehension, spatial perception, visual-constructional and spatial abilities, motor dexterity, processing speed, memory, and areas of attention (Lezak et al, 2004). Finnish standardized tests were used to measure reading, spelling, and mathematical difficulties in offenders. In Study III the research methods included questionnaires filled in by the subjects themselves. Interviews were carried out by nurses. In the interview, information was gathered about childhood background, socio-demographic factors, and substance abuse. Psychiatric symptoms were assessed by the standardised questionnaire, and the subjects also participated in the Structured Clinical Interview for DSM-IV (First et al., 1997) Axis I and II Disorders (see measures in Table 2). The background information about the subjects was based on the information from the interview carried out by nurses. It was not possible to take into account the interrater reliability. More detailed information about the tests and norms is given in the original articles.

Table 2. The Assessment Methods Used in the Thesis.

Method	Study I	Study II	Study III
Neurocognitive assessment			
The Wechsler Adult Intelligence Scale-III (WAIS-III; Wechsler, 1992; 2005)	x	x	x
The Wechsler Adult Memory Scale –Revised (WMS-R; Wechsler, 1987)	x	x	x
The Purdue Pegboard (Tiffin & Asher, 1948)	x	x	x
The Rey-Osterrieth Complex Figure test (ROCF; Meyers & Meyers, 1995; Rey & Osterrieth, 1993)	x	x	x
Continuous Performance Test (CPT II; Conners, 2005)	x	x	x
The Wisconsin Card Sorting Test, computer version 4 (WCST, CV4; Heaton, 2003; Heaton et al., 1993)	x	x	x
Assessment of academic difficulties			
The screening test for reading, reading comprehension and spelling for the young and adults (Holopainen, et al., 2004)		x	x
The Test for Arithmetic (KTLT; Räsänen & Leino, 2005)		x	x
Psychiatric evaluation/assessment			
The Crown Crisp Experiential Inventory (CCEI; Crown & Crisp, 1966)			x
The Structured Clinical Interview for DSM-IV (SCID-I, II; First et al., 1997)			x
The Psychopathy Checklist Revised (PCL-R; Hart et al., 1995)			x

3.4 Statistical analyses

Data were analysed using the SPSS (Statistical Package for the Social Sciences), version 14). Comparisons of the groups were made by one-way ANOVA with post-hoc tests (Tukey or Tamhane test depending on the result of the homogeneity of variance Test). P-values of less than 0.05 were taken as a statistically significant result.

The 12 sumscores of neurocognitive domains were used in a k-means cluster analysis. In the subgroup comparisons of offenders, the total IQ was examined as a covariate in a series of ANCOVAs, using each neuropsychological test score as a dependent variable and group membership as a design factor. The difference between the groups for all neuropsychological test scores as dependent variables in

the same model was tested using MANOVA. Estimated effect sizes (Cohen's *d*) were calculated to indicate standardized differences between two groups. The effect size was calculated by dividing the between-group difference in mean scores by the pooled-within-group standard deviation. Values of effect sizes were classified as small (0.2–0.49), moderate (0.5–0.79) or large (0.8 and more) (Cohen, 1969). The Bonferroni procedure, as well as the effect size calculations (Partial Eta Squared), were used to correct errors due to multiple contrasts. Frequency distributions were assessed by Pearson's chi-square test. Analyses of variance were made to predict outcomes for recidivism.

4. RESULTS

4.1 Study I: Neurocognitive performance among offenders

In the first study, our aim was to examine the neurocognitive performance in a sample of sentenced male prisoners in Finland. More specifically, we aimed to find out the frequency of neurocognitive deficits among offenders. Depending on the neurocognitive domain, from 5% to 49% of the men demonstrated marked neurocognitive deficits in tests of motor dexterity, visuospatial/construction skills, verbal comprehension, verbal and visual memory and attention shift (see Table 3). The average full-scale WAIS-III IQ for the whole sample was 91.8 (SD = 10.84, min = 71, max = 114). This was average or above for over half (58%) of the participants, whereas nine (12%) of them scored under 77.5 (1.5 SD). A Verbal Comprehension Index of 85.6 (VCI) was the lowest score. Overall, the Verbal IQ of the participants was significantly lower than the Performance IQ ($t(73) = -5.3, p < .001$).

Table 3. Performance on Neurocognitive Tests

	N	M	SD	Poor Performance % M \pm 1.0 SD	Very poor Performance % M \pm 1.5 SD
WAIS IQ Total	75	91.8	10.8		
WAIS VCI ¹	75	85.6	11.7	39.2	24.3
WAIS PSI	75	90.0	12.2	25.3	14.7
WAIS WMI	75	94.6	11.6	18.9	5.4
WAIS POI	75	96.1	13.5	21.3	10.7
Purdue Pegboard ²	74				
Right hand		13.6	2.1		37.8
Both hands		10.5	1.9		48.6
Assembly		27.7	5.3		24.3
ROCFT ²	72				
Copy		29.9	6.9	33.3	30.6
Delayed		15.6	7.2	45.8	41.7
CPT (T-scores)	75				
Commission errors		45.6	8.5	8.0	2.7
Omission errors		52.3	26.2	14.7	12.0
Hit RT		57.9	13.2	38.7	28.0
Hit RT SE		54.0	12.4	20.0	13.3
Perseverations		51.9	23.9	12.0	10.7
Confidence Index		54.6	18.0	25.3	22.7
Response Style		50.6	9.2	14.7	9.3
WCST	73				
Trials to category 1(actual score)		21.6	15.8		
Categories completed (actual score)		2.8	1.7		24.7
Perseverative responses (S-score)		95.5	10.3	17.8	0.0
Perseverative errors (S-score)		95.0	11.4	20.6	4.1
Non-perseverative errors (S-score)		87.2	15.1	41.1	32.9
Errors (S-score)		89.8	17.1	41.1	27.4
Conceptual level responses (S-score)		90.9	16.9	39.7	24.7
WMS-R (standardized scores)	75				
Immediate memory		6.6	2.5	48.0	37.3
Delayed memory		6.9	2.5	41.3	34.7

Note. ¹WAIS VCI = Verbal Comprehension Index, WAIS PSI = Processing Speed Index, WAIS WMI = Working Memory Index, WAIS POI = Perceptual Organization Index.²The cut-off points for “poor performance” and “very poor performance” were selected as the Mean \pm 1.0 SD and 1.5 SD of the published norms. In Purdue Pegboard, the cut-off point is 2.0 SD due to the decrease in subject scores compared to the original normative data (Purdue Pegboard, Quick Reference Guide, 1999).

Seventy offenders could be classified into three separate clusters (Table 4) by using the Cluster analysis. Two offenders, that comprised the third subgroup, performed poorly on almost every test. The first subgroup ($n = 38$) had lower scores on full-scale IQ, and on verbal and performance IQ separately, than the second ($n = 26$). After correcting for IQ, they also had significantly lower scores on the tests of working memory, spatial perception, verbal and visual-constructional memory than the second subgroup. The groups did not differ in offence category, the number of previous convictions or the length of the sentence. In comparing the neurocognitive performance in different offence categories, groups differed only on one test score. Verbal memory among the property offenders was significantly lower than in the group of drug offenders. There was also little difference in neurocognitive abilities according to number of convictions. The one significant positive correlation was between the number of previous convictions and the CPT-confidence index (classification accuracy between ADHD clinical vs. non-clinical profile), whereas a significant negative correlation was found between the number of previous convictions and CPT-response style.

Table 4. Test Performance for the Subgroups

	Group 1 (N = 38) Mean (SD)	Group 2 (N = 26) Mean (SD)	Cohen's d	p	Bonferroni - corrected
WAIS IQ	86.8 (7.7)	100.2 (8.6)	-1.64	< .001	< .008
WAIS PIQ	90.6 (10.0)	104.6 (9.3)	-1.45	< .001	< .008
WAIS VIQ	85.5 (9.2)	96.4 (8.3)	-1.25	< .001	< .008
WAIS WMI	91.2 (8.7)	102.4 (10.7)	-1.15	< .001	< .008
WAIS POI	91.2 (12.6)	104.3 (10.4)	-1.14	< .001	< .008
Motor dexterity	19.9 (2.8)	22.4 (3.1)	-.85	< .05	< 0.4
Visual memory	27.9 (8.2)	32.8 (3.0)	-.88	< .001	< .008
Verbal memory	6.1 (2.0)	8.7 (1.6)	-1.44	< .001	< .008

Note. Results other than IQ scores were checked with IQ as covariate and with no significant changes.

The main result of the first study was that a range of neurocognitive deficits was common among offenders, especially in motor dexterity, visual construction, verbal comprehension, verbal and visual memory, and shifting attention. Furthermore, recidivist men had problems indicating impulsivity.

4.2 Study II: The academic skill deficits among offenders

The aim of the second study was to determine the frequency of reading, spelling, and mathematical difficulties among Finnish male offenders. Of the offenders, 22.7% had severe problems in reading and 25.3% of the participants had equally severe problems in spelling (Table 5). When looking at the lowest 8 % of the population norms, 36.0% of the participants had problems in reading, 28.6% in reading comprehension, and 33.3% in spelling. In the mathematics test, 15.1% had at least medium-level problems. Of those, 72.7% had from medium to severe problems in at least one other area of academic skills.

Table 5. Percentages of Prisoners with Poor Academic Skill Performances in Different Severity Categories.

	Mean (SD)	Severe problems 4 % ^a	Medium problems 8 % ^b	Minor problems 12 % ^c
<i>Reading</i>	46.1 (19.1)	22.7	36.0	44.0
<i>Reading Comprehension</i>	29.1 (12.3)	14.3	28.6	35.1
Find misspellings	42.1 (21.4)	22.7	36.0	46.7
Word chains	50.2 (18.9)	22.7	41.3	46.7
<i>Spelling</i>	17.0 (3.3)	25.3	33.3	41.3
Spelling, normal words	18.3 (3.1)	22.7	30.7	30.7
Spelling, pseudo-words	15.5 (4.1)	28.0	36.0	45.3
<i>Mathematics</i>	8.2 (2.9)	11.0	15.1	26.0

Note ^a The lowest 4% of the distribution of the population. ^b The lowest 8% of the distribution. ^c The lowest 12% of the distribution (Holopainen et al., 2004).

When studying the correlations of academic features and neurocognitive deficits (Table 6), reading had the strongest correlation with working memory, processing speed, spatial perception and motor dexterity. Inattention and impulsivity had a negative association with reading, indicating that high impulsivity and problems with inattention were associated with low reading skills. All neurocognitive variables except vigilance correlated significantly with reading comprehension. Reading comprehension correlated negatively with impulsivity but positively with set shifting. Thus, high impulsivity had a negative impact on reading comprehension, whereas the ability to shift attention had a positive effect on reading comprehension. Mathematics correlated strongly with working memory, verbal comprehension and

academic skills. No differences were found in academic functioning between groups of prisoners in different criminal categories.

Table 6. Correlations between Academic Skills and Neurocognitive Performance.

	Motor dext	Proc speed	Visual cons	Spat percep	Verb comp	Visual mem	Verbal mem	Work mem	Inatten	Vigil	Impuls	Set shifting
Reading	.35**	.45**	.21	.38**	.43**	.31**	.22	.60**	-.30*	.01	-.28*	.17
Reading Compreh	.38**	.34**	.26**	.35**	.45**	.44**	.36**	.50**	-.32**	.08	-.27**	.29*
Spelling	.20	.10	.12	.24*	.46**	.21	.15	.37**	-.04	-.04	.04	.03
Mathematics	.35**	.35**	.30*	.40**	.51**	.31**	.211	.65**	-.13	.11	-.09	.41**

Note * Correlation significant at the 0.01 level (2-tailed). ** Correlation significant at the 0.05 level (2-tailed).

The whole sample was classified on the basis of the cluster analysis into two separate clusters (see Tuominen et al., 2014b). The first subgroup (N=26) had no neurocognitive or intellectual deficits. The second subgroup (N=38) had neurocognitive deficits in working memory, spatial perception, and visual-constructional ability. This group also had the lowest general intellectual functioning, as well as problems in Reading, Reading Comprehension, Spelling, and Mathematics.

The comprehensive neurocognitive deficits and illiteracy problems seemed to go together among prisoners. The results showed a high number of reading and spelling difficulties. Fifteen percent of those with medium to severe problems in academic skills had marked difficulties in mathematics.

4.3 Study III: Association of neurocognitive and academic difficulties and psychiatric disorders

In this study, our aim was to investigate how neurocognitive and academic difficulties and psychiatric disorders, including substance dependence, are associated with criminal recidivism among male offenders in a Finnish offender population.

Psychiatric symptoms were assessed by the standardised questionnaire, and the subjects also participated in the Structured Clinical Interview for DSM-IV Axis I and II Disorders (First et al., 1997). There was a high frequency of psychiatric disorders in our sample (Table 7). Lifetime Anxiety disorder was diagnosed in 22.8% (current 8.9%), and Lifetime Affect disorder in 26.6% (current 13.9%). Schizophrenia and psychotic disorders were by contrast rare (current 2.5%). The prevalence of Personality disorder was 70.9%. Antisocial personality disorder was the most common (65.8%), while 22.6% were psychopathic. Self-reported anamnestic head traumas (42.0%) were common. Ninety-one percent of the offenders were diagnosed with Substance disorder. Lifetime Substance use dependence was diagnosed in 75.9% of the participants. Ninety-one percent of the offenders met the criteria for at least one Axis-I diagnosis (current 41.8%, lifetime 91.1%). Psychiatric symptoms were evaluated by the CCEI questionnaire (Crown & Crisp, 1966). The CCEI correlated with deficits in Attention Shift ($p < .01$) and in Working memory ($p < .01$) both of which refer to executive functions. The CCEI Depression subscale was connected with attentional functions such as Inattentiveness and Impulsivity. Depression also correlated negatively with Motor Dexterity, Processing speed, Working memory, Visual Construction, Reading comprehension, Technical reading, and with Mathematics. The subscale Somatic Anxiety correlated with Reading comprehension and with Mathematics.

Table 7. Prevalence (%) of Psychiatric Disorders (N=72) of the Offenders.

	Current	Lifetime
Substance use dependence	20.3	75.9
Schizophrenia and other psychotic disorders	2.5	3.8
Affect disorder	13.9	26.6
Anxiety disorder	8.9	22.8
Any Axis-I disorder	41.8	91.1
Personality disorder	na	70.9
Antisocial personality disorder	na	65.8
Borderline personality disorder	na	15.2
Paranoid personality disorder	na	8.9
Psychopathic personality disorder ¹	22.6	na
Mental health disorder	93.7	na
Psychiatric diagnosis	77.2	na
Psychiatric treatment history	33.3	na
Head trauma ²	na	42.0

Note. ¹26 or more points of 40 (Jüriloo et al., 2013). ²Self-reported anamnestic head trauma. na = information not available.

Having a current Axis-I diagnosis was most strongly connected with neurocognitive deficits. Motor dexterity, Processing Speed, Verbal memory, Inattentiveness, Impulsivity, and Set Shifting were inversely connected with an Axis-I diagnosis. Academic skills such as Reading comprehension and Technical reading were also inversely linked to an Axis I- diagnosis. In addition to Axis I, also Substance dependence was connected with neurocognitive and academic deficits. Reading scores were lower in those with substance use dependence (for Reading comprehension). Substance use dependence was also connected with lowered Processing Speed. Self-reported head traumas were not connected with psychiatric diagnoses or neurocognitive deficits. Neither did scoring 26 points (Jüriloo et al., 2013) or more on the Psychopathy Checklist Revised Scale relate to neurocognitive deficits. However, those with 26 or more points had a longer length of sentence, defined as duration of incarceration in months ($p = .006$) than those without the disorder.

4.3.1 Neurocognitive deficits and substance dependence: connections to recidivism

Variables of neurocognitive performance (motor dexterity, visuospatial/construction skills, verbal comprehension, verbal/visual memory and attention used as cluster variable) and academic skills (Reading comprehension and Mathematics), background factor (institutionalized as a child), psychiatric symptoms (CCEI) and psychiatric diagnoses (Axis I, Substance dependence) were included in a General linear model in order to assess possible factors that could be connected with the number of previous convictions. Neurocognitive deficits comorbidly with current substance dependence were associated significantly with the number of previous convictions ($F = 11.65$, $p < .01$, $n^2_p = .30$). Neither neurocognitive nor psychiatric symptoms alone predicted the number of previous convictions. Offenders with only one or two previous convictions had fewer neurocognitive deficits, Axis I disorders, less substance dependence and fewer personality disorders ($p = .011$) than those with several convictions. Also psychiatric symptoms assessed by CCEI were connected to the number of previous convictions.

5. DISCUSSION

Although research has consistently shown that prisoners have high rates of neuropsychological deficits, academic difficulties and psychiatric disorders, there has still been a lack of information regarding neurocognitive profiles and neurocognitive functioning according to offence category and recidivism. To our knowledge, a study which combines neurocognitive and academic difficulties with associated disorders has not been presented earlier.

The aim of this thesis was to examine the neurocognitive and academic performance, and psychiatric disorders in a sample of sentenced male prisoners in Finland. We focused on the frequency of neurocognitive, reading, spelling, and mathematical difficulties among offenders. Also their connections with psychiatric and substance dependence disorders in the case of recidivism was one of our interests.

The salient findings in the present work were as follow. A range of neurocognitive deficits is common among sentenced male offenders, especially in motor dexterity, visual construction, verbal comprehension, verbal and visual memory, and shifting attention. Recidivist men had problems indicating impulsivity. The results also showed a high number of reading and spelling difficulties among offenders. Major mental disorders (Axis I diagnosis) and substance dependence were connected with neurocognitive and academic difficulties. Moreover, first- time offenders had fewer neurocognitive deficits and Axis I disorders, less substance dependence and fewer personality disorders than those with several convictions. The combination of neurocognitive deficits and substance dependence was connected to recidivism. According to the results, the Finnish male offender could be described using four groups with different characteristics of neurocognitive, academic and psychiatric factors. The first profile group consists of offenders with marked neurocognitive deficits, the second group with academic difficulties and neurocognitive deficits, the third group of those with neurocognitive deficits and substance dependence, and the fourth was formed of those with a combination of major mental disorder (Axis I disorders) and neurocognitive deficits.

5.1 Neurocognitive deficits in sentenced male offenders

According to my thesis, a range of neurocognitive deficits is common among sentenced male offenders. Compared with the general population, offenders perform poorly on motor dexterity, visual-spatial/construction tasks, verbal comprehension, verbal and visual memory, and in shifting attention. Our results are in partial agreement with the study, where the offenders performed poorly on an attentional set-shifting task but showed better performance on working memory (Bergvall et al., 2003). Rather than working memory difficulties, verbal and visual memory deficits as measured by WMS-R were notable in our sample, suggesting that more general memory deficits are quite common in a prison population. Poor visual-perceptual-organizational skills, which we also found, have been reported as crucial handicaps against developing academic skills, and may lead to poor socialization and adaptation (Rourke, 1989; Hernadek & Rourke, 1994). Connections between this nonverbal learning disability including visuospatial difficulties and socioemotional disorders has been quite extensively studied but usefulness of this concept in clinical practice has also been criticised (Spren, 2011). However, from an intervention perspective, it is important not only to recognise visual-perceptual deficits and problems in psychomotor coordination, but also the fact that they may be connected to deficits in social perception, social judgement, and social interaction.

Depending on the neurocognitive domain, from 5% to 49% of the offenders demonstrated marked neurocognitive deficits. It is therefore possible to speculate the possible prevalence of ADHD in our sample of offenders. According to our results, a rough estimate of the prevalence of ADHD could be approximately ten times higher than in the normal adult population. The prevalence of ADHD in adults has been evaluated to be in the range 2-5% (Kooij et al., 2010). We were interested in finding different neurocognitive profiles or offender groups (Study I). Two subgroups of offenders were distinguished by quantitative differences in intelligence measures. Subgroups also differed according to motor dexterity, visual-construction, and verbal memory, even after controlling for intelligence. It was, however, obvious that the whole psychiatric condition as a whole must also be taken into account since there is noticeable comorbidity between these factors. More specifically, neurocognitive deficits and academic difficulties among male offenders may be associated with a psychiatric diagnosis including substance dependence (Study III).

Furthermore, these disorders and background factors may be associated in the recidivism of the offenders (Study III).

One of the research question was whether there were distinctive neurocognitive performances according to offence category. The participants were grouped according to their index offence as violent (personal assault), property (property-related offences) and drug (drug or drunken driving) offenders. The three groups did not markedly differ on test scores. The results suggested that attention to both generalised and specific neurocognitive deficits as criteria for program entry may be more useful than allocating them by type of offending. The findings on offence type were consistent with those of Beggs and Grace (2008); however, others have found more severe neuropsychological deficits among violent offenders than property offenders (Bryant et al, 1984), or that violent offenders may have more executive function difficulties than non-violent offenders (Baker & Ireland, 2007; Cohen et al., 1999; Meijers, et al., 2017). In this study, the relatively small sample size may limit the statistical power to bring out the significance of differences between the different offence types.

The results on association between number of previous convictions and attention deficits was supported by the negative correlation between convictions and response style, indicating a lack of concern about making mistakes. Possibly also related was the strong indication of deficits in performances demanding attention shifts, and to some extent in focusing attention and impulsivity, although problems in vigilance and working memory were not prominent. All these functions come under the more general concept of executive functions including inhibitory control, working memory, and cognitive flexibility (Diamond, 2013). The concept of executive functions can be used in considering the results of our study. For example, at the behavioral level, poorer executive functions emerged as poor ability to control impulses and emotions (inhibitory control), reasoning like seeing connections between seemingly unrelated things (working memory), or to change perspectives spatially or interpersonally (cognitive flexibility).

5.2 Academic difficulties associated with neurocognitive deficits

The strong link between academic difficulties and deficits in neurocognitive functioning in male offenders points to the comorbidity of these disorders. Low

academic skills, especially in reading and spelling, were related to poor neurocognitive performance in motor dexterity, verbal and visual memory, inattentiveness, and attention shift. Deficits especially in working memory seem to affect performances on all the measured academic skills. In earlier studies, at least reading problems have been connected with deficits in working memory (Wijsman et al., 2000; Willcutt et al., 2001). Associations between academic difficulties and attentional deficits have been found in other studies (Dåderman, Lindgren, & Lindberg, 2004; Mayes, Calhoun, & Crowell, 2000; Willcutt & Pennington, 2000), although opposite findings have also been reported (Biederman et al., 1994).

Our results showed a high incidence of difficulties in reading, writing, and mathematics in male offenders. One third of the sample had from medium to severe problems in two academic skills, while almost thirteen percent had equally marked difficulties in all three academic skills. The high incidence of reading and spelling problems among offenders has also been found in other studies (Rasmussen, Almvik, & Levander, 2001; Svensson, Lundberg, & Jacobson, 2003), and much higher figures than in this study have also been reported (Samuelsson, Herkner, & Lundberg, 2003). One might argue that the low educational background, typical of offenders, may explain the poor academic skills. However, the educational background of the offenders in this study was generally comparable to the overall adult population in Finland, in terms of completion of compulsory formal education (9 years). The basic skills required for the reading and spelling tests assume only the basic level, which could already be achieved during compulsory education.

According to Svensson (2011), low IQ among offenders is connected with poor performance in reading and writing. In his review, Svensson (2011) suggests that it may be precisely the reading and writing disabilities that act as an underlying factor connecting low IQ and offending. As has been found in some earlier studies (e.g. Syngelaki, Moore, Savage, Fairchild, & Van Goozen, 2009), a reduced general intelligence of the participants was also found in the present study. The IQ also differentiated those with and without academic difficulties. After the effect of IQ was controlled for, the difference persisted in Reading Comprehension, Spelling, and Mathematics. The relationship between the neurocognitive deficits and general intelligence is, however, complex. The number of participants who scored under 1.5 SD below the general population IQ-mean is smaller than the number of similarly poor performances in other neurocognitive functions. This demonstrates that IQ

cannot explain all the neurocognitive deficits of the offenders. Furthermore, lower IQ scores may be a consequence of neurocognitive deficits (Mariani and Barkley, 1997). Neurocognitive deficits may have a gatekeeper role; they inhibit academic skills from developing.

A link between dyslexia and executive functions, especially in violent offenders, has been reported earlier (Baker & Ireland, 2007; Ireland & Rogers, 2004), but our study supports the view that there is a high comorbidity of deficits in academic skills with a wide range of neurocognitive deficits, regardless of offence type. Moffitt (1993) suggested that childhood neuropsychological deficits are linked to persistent antisocial behavior through a cumulative and contemporary process involving neuropsychological vulnerabilities and criminogenic environments. It has been claimed that low verbal IQ scores combined with family adversity increases the odds of early onset of offending (Gibson, Piquero, & Tibbets, 2001). According to a study by Koenen, Caspi, Moffitt, Rijdsdijk and Taylor (2006), there is an association between low IQ and antisocial behavior. It is possible that different offender types are differently affected by gene-environment interactions (Barnes, Beaver, & Boutwell, 2011), even though there is also evidence of genetic factors explaining the majority of the stability in offending behavior over time (Barnes & Boutwell, 2012). In addition to the role of genetic factors, neurocognitive deficits and academic difficulties may also be a consequence of a head injury. According to the epidemiologic study of Shiroma, Ferguson and Pickelsimer (2012), the prevalence of traumatic head injury in an offender population was over 60%. Of course it can also be vice versa: the offender with neurocognitive deficits may drift into irresponsible conduct and injuries. In the current study self-reported head injuries did not associate with neurocognitive or academic deficits.

In any case, the academic deficits seem to have some effects which may predispose to a criminal career. In this study, the number of schooling years seemed to associate with reading comprehension skills in that those offenders who had difficulties in reading comprehension had not carried on educating themselves. Furthermore, there was also a link between the academic difficulties and later working history. Those with academic problems did not end up with long and continuous employment. According to the National Institute for Health and Welfare of Finland (Karvonen & Kestilä, 2014), those young adults who have only completed the compulsory 9 years of schooling, are at risk of becoming socioeconomically

excluded. Reading problems among offenders may also have a functional effect in other areas of daily life. If reading skills, especially reading comprehension, could be increased, this would have a functional effect (Vanderberg, Pierce, & Disney, 2011) on daily life, for example, offenders may find it easier to communicate, and reading comprehension may also increase their ability to better understand general communication and interaction of different kinds.

5.3 Neurocognitive deficits and mental disorders among offenders

Neurocognitive functions like motor dexterity, processing speed, inattention, impulsivity, and attention shift were poorer among offenders with an Axis I diagnosis. Difficulties in academic skills such as in reading comprehension and technical reading were also linked to an Axis I disorder.

If neurocognitive deficits are combined with psychiatric conditions and these underlie the adaptive functioning impairments among offenders, the need for rehabilitation and treatment by medication, psychotherapy and neuropsychological interventions is obvious. According to a wide review, offenders with a mental disorder are at increased risk of negative outcomes such as self-harm, suicide, and violence (Fazel, Hayes, Bartellas, Clerici, & Trestman, 2016). Neurocognitive deficits may cause helplessness and anxiety through the experience of not being able to cope with everyday demands. Awareness of depression may be connected with decreased sense of subjective effort; not willing to try hard enough. The depression subscale score of the self-report questionnaire (CCEI), was linked significantly to neurocognitive and academic deficits. Neurocognitive deficits may also have an influence on the development of depression for the same reason: awareness of deficits may increase the chance of failure in general (Austin, Mitchell, & Goodwin, 2001). Reading and playing computer games are among the most typical entertainment activities in the prisons in Nordic countries. Not being able to handle these properly may contribute to being excluded in the prison setting. Feelings of shame, problems in self-esteem, and the experience of isolation and exploitation from other offenders may contribute to feelings of depression.

High scores on PCL-R did not associate with neurocognitive deficits in our study. The PCL-R cut-off score of 26 was used in this study (Jüriloo et al., 2013). The literature shows associations between neurocognitive deficits and psychopathy and

antisocial personality disorder (Roussy & Topin, 2000), but there are also quite opposite results (Brito, Viding, et al., 2013; Chamberlain et al., 2016). The results of the present study and the literature (Dolan & Park, 2002) may be interpreted such a way that offenders with antisocial personality disorder, regardless of psychopathy, show neurocognitive deficits, especially impulsive behavior. There has been evidence that the offenders with moderate PCL-R scores (21-29) may have impaired executive functions (Mitchell, Fine, Richnell, et al., 2006).

Substance dependence was associated with neurocognitive and academic deficits, particularly in processing speed and reading comprehension. In the sample the prevalence of different classes of intoxicants varied. Naturally, the amount of alcohol users was highest. It is obvious that chronic use of a substance is associated with neurocognitive function deficits (Cardenas, Studholme, Meyerhoff, Song, & Weiner, 2005). For example, alcohol dependence has been linked to neurocognitive impairments (Bates, Bowden, & Barry, 2002). According to the meta-analysis by Stavro, Pelletier, & Potvin (2012), there were significant impairments in several cognitive domains, such as verbal fluency and language, processing speed, memory functions, attention, inhibition, and visuospatial abilities. Furthermore, cognitive impairment remained fairly stable during the first year of sobriety. Our study showed a range of neurocognitive deficits among offenders and many of these had alcohol abuse problems. It is, however, to be noticed that sobriety comes naturally with imprisonment, and in our study the mean time of the duration of incarceration was over three years.

An interesting question is: what are the effects of prison and incarceration? A major source of stress comes from lack of personal choice within the prison environment, loss of control over social and emotional matters, withdrawal, the threat or persistent fear of victimization and the shame of imprisonment (Tomar, 2013). Difficult life experiences can foster negative expectations that in turn cause negative thoughts and even depressive thinking (Wenzlaff, 2004). A prison is an impoverished environment, which may have a negative influence on mental health and brain functioning (Meijers et al., 2015). It may therefore also have consequences for neurocognitive functions. Imprisonment may also have an impact on the course of mental illness or comorbidity with other disorders. Bonta and Gendreau (1990) suggest that individual differences may affect adapting to prison life. Those with significant neurocognitive or psychiatric deficits may therefore be the most

vulnerable groups for increasing mental health problems. On the contrary, a time in prison could present an opportunity to detect, diagnose and treat mental disorders. There may be the possibility to live a sober life and have meaningful relationships with fellow offenders. Prison may also provide a stable routine which can improve neurocognitive functioning.

5.4 Factors associated with recidivism

The major finding was that a combination of neurocognitive deficits and substance dependence, is strongly associated with recidivism. It is well known that mental disorders carry an increased risk for recidivism (Arsenault, Moffitt, Caspi, Taylor, & Silva, 2000; Fazel & Grann, 2006) but the role of comorbid substance dependence in it is under debate (Ogilvie et al., 2011; Fazel, Langtsrom, et. al., 2009), although substance dependence has been shown to be related to criminal behavior (Van der Putt, Creemers, & Hovee, 2014) and recidivism (Walter, Wiesbeck, Dittmann, & Graf, 2011). However, it is not clear how primary neurocognitive deficits themselves may underpin difficulties regulating drug-seeking behavior (Yücel, Lubman, Solowij, & Brewer, 2007). It is also possible that substance-induced neurocognitive impairments may increase the risk of engaging in criminal behavior (Ogilvie et al., 2011). When discussing the risk factors for offending and recidivism, the focus is usually on individual, family, and social factors (Jolliffe, Farrington, Piquero, Loeber, & Hill, 2017). Risk factors that have been associated with offending in general, are low academic achievement, hyperactivity, and lack of empathy (Piquero, Jennings, Farrington, Diamond, & Gonzales, 2016). As a neurocognitive deficit, ADHD has been found to be crucial in the development of antisocial behavior. In the follow-up period of 15 years ADHD was associated with recidivism, even after controlling for the antisocial personality disorder (Philipp-Wiegmann, Rösler, Clasen, et al., 2017).

When we looked at recidivism according to previous convictions, we found that first-time offenders had fewer neurocognitive deficits, Axis I disorders, substance dependence or personality disorders than those with several convictions. In a recent review of life-course-persistent, adolescence-limited, and late-onset offenders, those with a longer criminal career tended to have more risk factors (Jolliffe, Farrington, Piquero, Loeber, & Hill, 2017). Our results suggested that the more previous convictions there were, the more lifetime psychiatric disorders and

psychiatric symptoms existed. According to the literature, offenders with co-occurring disorders have more extensive criminal histories than offenders with substance abuse or mental disorders alone (Wilton & Stewart, 2012). Thus, it is possible that having a psychiatric disorder or neurocognitive deficits acts as a risk factor for a prison career. Moffitt (1993, 2003) has pointed out that life-course-persistent offenders start their criminal career at a young age and also show continuity in their antisocial acts over time. The group was characterized by antisocial behavior at an early age, poor social environment and neuropsychological deficits associated with serious offending and violence. In a more recent study of Moffitt's theory, social network played, interestingly, an important role by socially rewarding antisocial behavior (Leaw et al., 2015). In this study, the age for ending up in prison for the first time also seemed to be connected with previous convictions in such a way that those with a longer criminal history started at a younger age than those with a short criminal history. It is notable, however, that the first-timers, who are also usually younger than recidivist offenders, have a naturally shorter substance abuse history than older offenders. The possible effects of substance use on the neurocognitive skills are therefore not so extensive. First-timers also have a shorter time since attending school, so the academic skills are still fresh in their minds. Adequate academic skills may act as a protective factor against maladjustment. The age, however, did not separate the groups of first-timers and recidivist offenders regarding the number of convictions. Relatively few individuals characterized by early onset of criminality, substance abuse, and personality disorders will account for the majority of violent crimes (Falk et al., 2014). Indeed, there are more recidivist offenders than first-time offenders in prison so the number of recidivist offenders is overweighted in our sample, as are the comorbid problems among these offenders. As we do not yet know whether the first-timers in our sample will end up with a prison career later on, in order to obtain more specific answers to the association between the neurocognitive factors and recidivism, a follow-up study is needed.

5.5 Four profile groups

According to this thesis, the Finnish male offender could be described using four profile groups with different characteristics. We suggest that *the first profile group* of Finnish male offenders consists of those with marked neurocognitive deficits in working memory, spatial perception, and verbal and visual-constructional memory.

The comprehensive neurocognitive deficits and illiteracy problems seemed to go together among prisoners. Those with both academic difficulties (Reading and reading comprehension and mathematics) and neurocognitive deficits comprised *the second profile group*. The combination of neurocognitive deficits and substance dependence was strongly connected to recidivism. Those with this combination could be suggested as *the third profile group* of Finnish male offenders. *The fourth profile group* could be seen as those with a combination of major mental disorder (Axis I disorders) and neurocognitive deficits.

To our knowledge, this kind of classification of the offenders with neurocognitive and academic difficulties with associated disorders has not been presented earlier. Our results support the view that each profile has neurocognitive deficits in addition to associated disorder or difficulty. Rather than grouping the offenders according to the diagnoses (such as Axis I disorder, substance dependence or ADHD) the profiles reveal multiple risk factors or factors to focus intervention on more specifically.

Criminal offenders differ in many ways and subtyping psychopaths is also one way to classify offenders. For example, the four-cluster-model of Psychopaths (Swogger & Kosson, 2007) gives information about core features of psychopathy. The first group had low anxiety scores but many violent crimes. The second group of psychopaths had high anxiety or negative affect along with considerable drug and alcohol problems. Also antisocial behavior was common. The third group was characterized by low psychopathology with fewer violent crimes and less criminal versatility but nonviolent crimes to the same extent as in other groups, demonstrating social deviance. The fourth group of offenders had negative affect but nonpsychopathic traits.

5.6 Suggestions for the intervention and rehabilitation

The offenders often have broad difficulties in fundamental neuropsychological functions such as memory, attentiveness, and motor dexterity, in addition to functional illiteracy. Therefore, the extensive comorbidity of functional illiteracy with poor neurocognitive performance found in the present study poses a definite challenge for the rehabilitation of offenders. Such offenders may not benefit sufficiently from the traditional interventions which are used in prisons nowadays.

Based on our study, we suggest that both selection and preparation for participation in offender programs might be more effective if specific neurocognitive deficits are identified and efforts first made to ameliorate them. Given the extent of combined illiteracy problems and neurocognitive deficits in these male offenders, a broad neuropsychological assessment should be carried out to enable better focused and more effective rehabilitation. It may not be enough to train reading or develop the literacy activities; focusing the intervention on comprehensive neurocognitive deficits is also necessary. It would be important to develop methods to train these fundamental neuropsychological functions before focusing on more precise intervention such as courses dealing with reading and writing difficulties or programs dealing with emotions and aggressive behavior.

Poor visual-perceptual and spatial deficits among the offenders found in our study may for their part associate with difficulties in everyday tasks like tool use or processing outside information. According to a large meta-analysis (Uttal et al., 2013), spatial skills are malleable, and training in these skills is effective, even transferable to other situations. The results not only shed light on spatial training but can also enrich education by adding an important part that predicts STEM (science, technology, engineering, mathematics) achievement.

Svensson (2011) concluded that if offenders have more general deficits in reading and writing it would be easier to intervene simply by providing more time and a more appropriate environment for reading. This is important since those who read more, are also more proficient in reading comprehension and technical reading (Mol & Bus, 2011). Furthermore, low-ability readers are less likely to improve their reading because they have no motivation to read. One way forward could be to arrange small study or reading groups focusing on the core meaning of reading and changing reading habits. Developing the literacy activities would be the crucial technique because poor reading skills are often caused by scarce reading habits combined with problematic schooling. Digital techniques and game-based learning have shown promising effects in training reading (especially literacy and reading fluency skills and mathematical skills (Aro & Lyytinen, 2016; Heikkilä, Aro, Närhi, Westerholm, & Ahonen, 2013; Ronimus, Kujala, Tolvanen, & Lyytinen, 2013). There have been reading interventions and published studies with incarcerated individuals and their literacy ability but there is little reliable information in this area (Sander, Amoscato, Fieher, & Funk, 2012). In a recent study of Svensson, Fälth, Persson, and

Nilsson (2016), a short reading intervention brought improvement, especially in reading comprehension among forensic patients. However, our results suggest that the offenders have broad difficulties in fundamental neuropsychological functions such as memory, attentiveness, and motor dexterity, in addition to functional illiteracy. The results also give a rather hopeless picture of the possibilities in the field of rehabilitation. There may be offenders in prison, whose opportunities to improve their neurocognitive or academic skills or to benefit from the interventions in general are rather rare in the way such interventions are realized today.

In a recent pilot study, cognitive remediation was used to target cognitive flexibility, memory, and planning in female offenders (Rocha, Margues, Fortuna, Antunes, & Hoaken, 2014). In addition to positive changes in neurocognitive domains, a decrease was also found in depression and anxiety. Furthermore, research has shown promising results in terms of improving cognitive capacity through cognitive training, for example, in the case of memory (Bäckman et al., 2011; Dahlin, Stigsdotter, Larsson, Bäckman, & Nyberg, 2008).

Improvements in working memory functions after specific training were related to changes in the dopaminergic system in both young and older adults (Dahlin et al., 2008). Furthermore, using content-specific ability and working memory training in combination may provide a greater benefit (Nemmi et al., 2016). There are, however, also contradictory results about the effectiveness of working memory training (Melby-Lervåg, Redick, & Hulme, 2016; Soveri, Antfolk, Karlsson, Salo, & Laine, 2017). Nevertheless, working memory training for those with addiction problems may be a useful adjunct to treatment (Mc Clure & Bickel, 2014); and even the smallest effects may be important to the offender who has a very negative sense of self and insufficient self-efficacy. An interesting idea is to train working memory by video game playing since video-game players perform better on several tasks that tap spatial working memory (Uttal et al., 2013). Another suggestion from the literature is that skill-based and cognitively focused training may be used simultaneously (Kearns & Fuchs, 2013) so that cognitive processes are not taught in isolation. For example, metacognitive strategies can be used in a skill-based writing intervention (Graham & Harris, 1989). Also cognitive behavioral therapy is known to affect the offenders' brain functioning (Vaske, Galyean, & Cullen, 2011). There is also discussion about whether brain plasticity during cognitive training could be enhanced (Constantinidis & Klinberg, 2016). These results in the literature suggest

that focused training may facilitate cognitive task performance, which may in turn increase the efficiency of rehabilitation of academic deficits. Also structured computer-based group training in mathematics may be useful. An interesting idea would be to develop a computer game consisting of exercises or a virtual environment with avatars in the field of executive and working memory functions and academic skills. Exercises built into game mode could interest especially young offenders.

Preventing the development of substance dependence together with rehabilitation of neurocognitive deficits seems to be important for reducing recidivism. Rehabilitation is most effective when interventions are matched to the individual needs of the offender, and the responsivity factors (Andrews, Bonta, & Wormith, 2011; Andrews & Bonta, 2010). Treatment readiness also includes adequate cognitive skills. Neurocognitive deficits may act as causal or maintaining factors behind the recidivism, while neurocognitive impairments may interfere with the capacity to assimilate and participate in rehabilitation programs that have a cognitive emphasis (McMurrin & Ward, 2010). Skill-based and cognitively focused training should be integrated in commonly used treatment models in prisons.

The use of ADHD-medication (atomoxetine) has been successfully increased (Ginsberg & Lindefors, 2012) after proper diagnosis of neuropsychiatric disorders and co-occurring substance use among offenders in Finland. However, the challenge is that offenders with ADHD also present comorbid conditions such as reading and writing difficulties and substance use disorder. It is also possible that offenders have generalised cognitive impairment regarding ADHD but they may have different profiles in addition to an ADHD diagnosis (Marceau et al., 2008). It is important to address the needs of offenders with ADHD and, in addition to appropriate medication, also other interventions for comorbid problems should be evaluated.

5.7 Strengths and limitations of the study

Seventy-two randomly selected male offenders participated in this study so the study sample is quite clear, representative and corresponded relatively well to the distribution of the principal offences of male prisoners in Finland. Secondly, we used a broad neurocognitive and academic test battery and psychiatric assessment including a self-rating scale, interviews, standardized questionnaire, standardized

psychiatric interview (SCID-I,II), and the prison information database. Neurocognitive and academic tests are all standardized and validated measures. To our knowledge, this kind of comprehensive assessment with a broad range of measures is rare.

The research contains several limitations. There was no control group in the neurocognitive assessment. By using a matched control group of nonoffenders it would have been possible to test for significant differences with those people not in prison. However, a control group should be a representative sample of the population from which the sample arises. It raises the question, what would have been an appropriate control group for this study group? Should it be comprised of nonoffenders without the target difficulties and disorders? What about other background factors? For these reasons it would have been quite difficult to define an appropriate control group. The second limitation was that the subgroups were rather small which may limit the statistical power to reveal differences between the groups. Furthermore, only the principal offence was taken into account. Information about the criminal history and previous conviction came from the official prison files so it may underestimate the offending rates and recidivism. It is also notable that the duration of incarceration is longer among homicide offenders than among offenders with other violent crime. Long-term imprisonment may cause mental health problems (Dudeck et al., 2011), even PTSD (post-traumatic stress disorder) symptoms (Liem & Kunst, 2013). When considering the impulsivity and recidivism, those with a long-term sentence may have not so many convictions as other types of offenders. Despite the “low” recidivist rate, homiciders may also show impulsivity; it just may not show up as recidivism. The lack of a follow-up also limits the conclusions concerning the criminal career. Not all offences will result in contact with corrective services. Possibly not all neurocognitive or attentional deficits can be measured by traditional neuropsychological tests and some important deficits may be missed in the current study. Performance-based measures (like WCST and CPT) and rating-scales may assess different aspects of executive functions (Toplak, West, & Stanovich, 2013) in such a way that performance-based measures capture processing efficiency and rating measures individual reflection about the phenomena. Performance-based measures offer information regarding performance in a highly structured environment with goals and outcomes set in advance for the testing situation. It is possible that some participants who performed well on

neuropsychological tests still cope poorly in real-life situations, and vice versa. Observation of functioning in daily life would have brought an interesting addition. Testing the relationship between impaired cognitive functions and general social behavior was beyond the scope of this study. A further limitation is that the studied populations are different from one country to another. The prison study results depend not only on the study design but also on the health system of the country. Finland has a well-developed public health care system, so associations between psychiatric disorders, substance use dependence and recidivism may be stronger in countries with less functional prison health care, although the number of psychotic prisoners in Finland has increased dramatically since 2005 (Jüriloo, Pesonen, & Lauerma, 2017).

5.8 Implications for future research and practice

Much research is still needed to better understand the factors behind the recidivism and to determine the deficits that have an impact on developing and sustaining the criminal career. Future research might focus on investigating recidivism in longitudinal studies. It would be interesting to follow the four different profile groups of offenders to see if and how they continue with their criminal career. Who are those who come back to prison and do they commit a violent or a property crime? According to our results, profile group four, first-timers with both neurocognitive deficits and substance dependence have a pronounced risk of becoming a recidivist. However, to obtain a more specific answer to this question, a follow-up study is needed. It would also be important to follow “the healthy ones” in our study. In the current study there were no explanatory factors for the criminal behavior of those offenders without neurocognitive, academic or psychiatric disorders. More longitudinal research should be carried out which includes reading and neurocognitive interventions, and a longitudinal study regarding the long-term effect of the interventions on everyday life in prison and recidivism.

One interesting viewpoint would be to take into account the motivational orientation profiles of the offenders to learning in later years. Although, motivational profiles have been studied mostly in children (see Laitinen, Lepola, & Vauras, 2017) it would be interesting to study how these motivational orientation profiles (for example, task-avoidance versus task-oriented) among offenders are connected to

neurocognitive factors, especially attentional deficits and later learning. It could be possible that neurocognitive deficits which hinder the possibility to benefit from intervention programs may also be assessed by different motivational profiles. If so, a lighter assessment procedure could be used. Neurocognitive deficits may be connected with low motivation and may increase the motivational vulnerability. Prospective studies are needed to shed light on these functions.

To summarize the results of this thesis, a range of neurocognitive deficits is common among sentenced male offenders and recidivist men had problems indicating impulsivity. The results also showed a high number of reading and spelling disorders among offenders. Major mental disorders and substance dependence were connected with neurocognitive and academic deficits. Moreover, first-time offenders had fewer neurocognitive deficits and Axis I disorders, less substance dependence and fewer personality disorders than those with several convictions. The combination of neurocognitive deficits and substance dependence was connected to recidivism.

The implication from this study is that more attention should be paid to neurocognitive deficits in addition to other criminogenic factors leading to recidivism. Neuropsychological assessment could be used to assist identification of individuals at high risk of problems in social judgement and social interaction, but also more specifically to distinguish those who may need some extra basic cognitive skills training before moving into the more social sphere. Rehabilitation of cognitive functions and academic skills, along with intervention for mental health problems, especially substance dependence, would help to break the vicious circle of criminal career, and promote a less criminal lifestyle.

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