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SIMULATION IN THE ASSESSMENT AND TREATMENT OF VIOLENT OFFENDERS

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Simulation in the Assessment and Treatment of Violent Offenders

THESIS FOR DOCTORAL DEGREE (Ph.D.)

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To Faith, Hope, and Love

Since I had an absolute belief that I should be able to handle my own problems, I naturally bought a horse.

-Kay Redfield Jamieson, *An Unquiet Mind: A Memoir of Moods and Madness*

Nana korobi ya oki [fall down seven times, get up eight].

- Japanese proverb

ABSTRACT

With the aim of ultimately reducing the burden of violent crime on society, research has identified a number of areas in which conventional methods of assessment and treatment of violent offenders may be improved. The areas examined in this thesis are gender, mental illness, and intimate partner violence, and they have been integrated with research in the field of case and computer simulation for assessment, training, and teaching. Firstly, paper-and-pencil case vignettes were used to investigate possible gender bias in forensic psychiatric assessment (study I). Secondly, interactive computer simulation was applied in two contexts; augmentation of the assessment of mentally disordered violent offenders within forensic psychiatry (study II) and the assessment and treatment of intimate partner violence (IPV) offenders within the Prison and Probation Service (studies III and IV).

In **study I**, the case vignette method did not reveal a significant association between the gender of the simulated offender and the judgement, by forensic psychiatric assessors, that the offender suffered from a severe mental disorder and was in need of compulsory, in-patient forensic psychiatric care. However, a simulated offender depicted as having mental retardation was more likely to be assessed as being at high risk of criminal recidivism if portrayed as female, regardless of the sex, place of work, or level of experience of the assessor.

In the studies of the interactive computer simulation program Reactions on Display (RoD), **study II** revealed significant differences between mentally disordered offenders (MDOs) and controls in the area of interpretation of the simulated characters' emotions and physical reactions, and the MDOs chose more violent actions on behalf of the main character compared with controls. There were also incongruent or deviant responses made by individual MDOs. This indicates that the Reactions on Display/Forensic Psychiatry (RoD/FP) has the ability to differentiate between MDOs and controls in several ways.

In **study III**, Reactions on Display/Intimate Partner Violence (RoD/IPV) was well received and understood, both by intimate partner violence (IPV) offenders and healthy, non-offender controls. Significant differences between the groups emerged in the area of interpretation of the simulated characters' emotions. Offenders who had not previously undergone treatment with the Integrated Domestic Abuse Programme (IDAP) showed a trend towards making more violent choices than other IPV offenders and controls.

In the healthy, non-offender controls who took part in **study IV**, the violent film sequences in the RoD/IPV elicited a subjective feeling of increased arousal and decreased valence on the Self-Assessment Manikin (SAM) scale. It did not, however, elicit a physiologically detectable stress response, i.e. a negative mood. This may allay fears that the film content is disturbing to a degree that it interferes with assessment/learning or pleasurable to a degree that it will be sought after for entertainment purposes.

While largely showing a consensus between Swedish forensic psychiatric assessors, the results provided by study I call for further research into the conformity of Swedish and international forensic psychiatric assessment practices. They also add to the body of research

advocating the development of improved methods for risk assessment of offenders, which is part of the rationale behind the computer simulation systems presented in studies II-IV.

The interactive computer simulation tools, studied in a pilot fashion in this thesis work (studies II-IV), have been found to be acceptable to all study groups. Significant differences between the offender and control groups have emerged, particularly with regard to their interpretations of the simulated characters' emotions and also differences in the level of violence chosen. This indicates that the offenders' interactions with the RoD program may provide additional information to traditional violence risk assessment methods (e.g. checklists) by showcasing dynamic risk factors (such as difficulties in emotional processing). The above properties may also be seen to support the future use of such programs for offender treatment, in which they can provide an engaging, safe, and controlled environment in which the user can observe and practice interactions and receive feedback from which he/she can learn desirable non-violent behaviours, and, in the specific case of the RoD/IPV, with minimal risk of negative side effects such as being excessively disturbed by its contents or using it as entertainment.

- Keywords: computer simulation, violent offenders, case vignette method, forensic psychiatric assessment, mentally disordered offenders, intimate partner violence, psychophysiological measures

SAMMANFATTNING PÅ SVENSKA

I syfte att minska våldsbrott i samhället har forskningen identifierat ett antal områden där konventionella metoder för utredning och behandling av våldsförövare kan förbättras. I denna avhandling är områdena kön, psykisk sjukdom och partnervåld i fokus och har integrerats med forskning inom fall- och datorsimulering. Skriftliga fallvinjetter användes för att undersöka möjliga könsskillnader i rättspsykiatriska bedömningar (studie I). Interaktiva datorsimuleringar tillämpades i två kontext; fördjupad bedömning av psykiskt störda våldsförövare inom rättspsykiatri (studie II) samt bedömning och behandling av partnervåldsförövare inom kriminalvården (studier III och IV).

Resultaten från **studie I** visar i stort en samsyn bland rättspsykiatriska utredare men belyser samtidigt behovet av mer forskning kring bedömningspraxis i den svenska och internationella rättspsykiatri. De bidrar även till den forskning som förespråkar utveckling av förbättrade metoder för riskbedömning av förövare, vilket är del av bakgrunden till datorsimuleringssystemen som presenteras i studier II-IV.

De interaktiva datorsimuleringssystemen som analyseras i denna avhandling (**studier II-IV**) mottogs väl av samtliga studiegrupper. Statistiskt säkerställda skillnader mellan de våldsdömda och kontrollgrupperna framkom, särskilt vad gällde tolkningar av de simulerade karaktärernas känslor samt skillnader i graden av våld som försökspersonerna valt i ett av programmen. Detta tyder på att våldsförövarnas interaktion med dataprogrammen kan ge information utöver de traditionella metoder som används vid våldsriskbedömning (t.ex. checklistor på papper) genom att de belyser dynamiska riskfaktorer så som svårigheter med känlobearbetning. Ovanstående talar för användning av sådana program i behandlingen av våldsförövare då de erbjuder en engagerande, trygg, kontrollerad miljö i vilken användarna kan observera, öva i och få feedback på simulerade konfliktsituationer och därmed lära sig önskvärda ickevåldsamma beteenden. I partnervåldsprogrammet har även risken för negativa biverkningar (såsom att bli allt för negativt påverkade av programmets innehåll eller att vilja använda det i underhållningssyfte) undersökts med psykofysiologiska metoder och befunnits vara minimal.

LIST OF SCIENTIFIC PAPERS

- I. Sygel, K., Sturup, J., Fors, U., Edberg, H., Gavazzeni, J., Howner, K., ... & Kristiansson, M. (2015). The Effect of Gender on the Outcome of Forensic Psychiatric Assessment in Sweden: A Case Vignette Study. Manuscript accepted for publication in *Criminal Behaviour and Mental Health*
- II. Arborelius, L., Fors, U., Svensson, A., Sygel, K., & Kristiansson, M. (2013). A new interactive computer simulation system for violence risk assessment of mentally disordered violent offenders. *Criminal Behaviour and Mental Health*, 23(1), 30-40.
- III. Sygel, K., Kristiansson, M., Furberg, R., & Fors, U. (2014). Reactions on Display/Intimate Partner Violence (RoD/IPV)—A Study of a New Interactive Computer Simulation Program for the Treatment of Men Convicted of Intimate Partner Violence. *International Journal of Forensic Mental Health*, 13(4), 369-380.
- IV. Sygel, K., Fors, U., & Kristiansson, M., (2015). Psychophysiological Reactions to a Computer Simulation-based Treatment Program for Men Convicted of Intimate Partner Violence. Manuscript submitted.

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LIST OF ABBREVIATIONS

AUDIT	Alcohol Use Disorders Test
ASD	Autism spectrum disorder
DUDIT	Drug Use Disorders Test
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
IPV	Intimate partner violence
IAPS	International Affective Picture Systems
HR	Heart rate
MDO	Mentally disordered offender
RoD	Reactions on Display
RoD/FP	Reactions on Display/Forensic Psychiatry
RoD/IPV	Reactions on Display/ Intimate Partner Violence
SAM	Self-Assessment Manikin
SARA	Spousal Assault Risk Assessment
SCL	Skin conductance level
SCR	Skin conductance response
SMD	Severe mental disorder
SPM	(Raven's) Standard Progressive Matrices
VP	Virtual patient

1. BACKGROUND

With the aim of ultimately reducing the burden of violent crime on society, research has identified a number of areas in which conventional methods of assessment and treatment of violent offenders may be improved. The areas examined in this thesis are gender, mental illness, and intimate partner violence, and they have been integrated with research in the field of case and computer simulation for assessment, training, and teaching. This thesis utilizes, firstly, traditional case vignettes to investigate gender bias among professionals performing forensic psychiatric assessments of offenders. Secondly, it uses interactive computer simulation in two contexts; the augmentation of the assessment of mentally disordered violent offenders within forensic psychiatry and the assessment and treatment of intimate partner violence offenders within the Prison and Probation Service.

1.1 WHAT IS AN OFFENDER?

To criminalize an act is to make it punishable through law (Lernestedt, 2003). The law is a set of rules that uses punishment to influence members of society to act, or refrain from acting, in a certain way. Laws are made, and unmade, through political decisions. Thus, ultimately, it is the government of a country that defines who is a criminal offender, not a specific set of behaviours or characteristics of an individual (Wennberg, 2011). What makes a criminal offender an offender varies greatly depending on the cultural norms in vogue in a certain geographical area at a certain period in time (expressed through legislative bodies). Thus it seems to be a hard task to identify an offender based on any characteristics that he or she might possess as an individual. It is also important to consider the wider ethical aspects of classifying someone as a potential offender based on a given characteristic, as has e.g. been done, with great detriment, through the work of Lombroso (2006), who, in the late 19th century, postulated that criminals represent a regression along the evolutionary scale with physical stigmata that prove psychobiological degeneration. It has since been proven that his research was severely methodologically flawed (Mazzarello, 2011), but it serves as an important lesson in so far as it illustrates the ethical dangers inherent in oversimplifying research into criminal predisposition. However, with over 10 million persons in prisons around the world and criminal recidivism rates reported to be as high as 50% in some jurisdictions (Chang, Larsson, Lichtenstein, & Fazel, 2015; Fazel & Wolf, 2015), there is a great need for reducing the burden of antisocial behaviour within many communities and within the lives of their individuals. This has led to the proposition of many theories of how to identify characteristics that predispose to antisocial and violent behaviour (Raine, 2002). Criminological and sociological theories have for e.g. focused on environmental, situational, social structural, economic and individual factors (Vila, 1994). There is a wealth of more recent, and more scientifically sound, research into psychosocial and biological risk factors, than that of Lombroso. This has looked into a wide variety of possible criminological factors in areas such as genetics, psychophysiology, obstetrics, brain imaging, neuropsychology and neurology, hormones, neurotransmitters, and environmental toxins, in the interest of classifying offenders, explaining offending behaviour and, in the future, possibly treating offenders and thus preventing crime (Raine, 2002).

1.2 VIOLENT OFFENDERS AND OTHER SELECTED SUBTYPES OF OFFENDERS

There are many different ways of classifying offenders. Which method is used depends largely on one's perspective and purpose e.g. allocation of treatment services or research. Some common classifications are according to type of crime (e.g. violent or non-violent crime, sexual crimes, Intimate Partner Violence, IPV), offender characteristics (e.g. juvenile or female offender), type and length of sentence within prison and probation services (probationary or prison sentence) or alternative sentence (such as, in Sweden, care under the Forensic Psychiatric Care Act or the Social Services Act).

In this thesis, particular attention is paid to the assessment and treatment of violent offenders. Douglas, Guy, Reeves, and Weir (2005) define violence as both physical and non-physical aggression, with physical aggression including "any attacks on a person" and non-physical aggression including "threats to harm a person, verbal attacks on persons, and 'fear inducing' behaviour such as attacks on objects". In this thesis, a violent offender is defined as a person who has been either prosecuted for or convicted of a violent crime in a criminal court.

Violent offenders, belonging to the sub-groups of offenders listed below, have been selected for the research involved in this thesis. These particular sub-groups were selected, from a clinical forensic psychiatric perspective, based on perceived gaps in offender research, assessment, and treatment.

1.2.1 Mentally disordered offenders (MDOs)

In their historical survey of "the origins of 'right and wrong'", Platt and Diamond (1966) describe examples from Hebrew law of "insane persons" and children being exempt from liability towards their victims if they should cause injury. They show that this concept evolved in Greek philosophy and Roman law, and that there was a unique role for children and the insane in the Christian theological literature, which heavily influenced medieval law. In Swedish criminal law, the earliest clear record of mentally disordered persons being singled out is in the penal code of 1734, in which it was briefly stated that mental disorder should reduce criminal responsibility, if not remove it completely (Statens Offentliga Utredningar, 2012). Since the introduction of the present Swedish Penal Code in 1965 ("Brottsbalken," 1962), the concepts of criminal liability and unfitness to stand trial have not been applicable, which sets Swedish criminal law apart from a majority of other jurisdictions. Instead, Swedish criminal law states that, if the defendant has committed an offence under the influence of a severe mental disorder (SMD), he or she should not primarily be sentenced to prison. If he or she has an SMD at the time of the forensic psychiatric assessment, he or she may instead be sentenced to compulsory forensic psychiatric care with or without court-ordered discharge.

SMD is a judicial concept and not related to specific diagnoses; rather the focus of the assessment is on the severity of the effects of the disorder and its relevance to the offending behaviour. SMD may include the following: all psychotic states, regardless of aetiology, severe depression with risk of suicide, severe personality disorder with recurrent episodes of psychotic symptoms, mental disorder with marked compulsive behaviour resulting in impairment of psychosocial functioning (e.g. autism spectrum disorder, ASD), severe mental

retardation, severe dementia, and severe brain damage. For example, offenders with schizophrenia are almost exclusively assessed as suffering from an SMD, whereas offenders with a sole diagnosis of antisocial personality disorder rarely are. In order to assess whether or not the offender has been under the influence of an SMD at the time of the crime, the court orders a forensic psychiatric assessment to be performed by the National Board of Forensic Medicine (see section 1.3.1). Approximately half of the offenders referred for assessment are found to have an SMD at the time of the index offence and an on-going need for forensic psychiatric care. The majority of these offenders are subsequently sentenced to forensic psychiatric care, but other outcomes such as a probationary sentence or acquittal are also possible. Once sentenced to forensic psychiatric care, an offender is treated in a county council-run forensic psychiatric hospital or on forensic psychiatric ward in a general psychiatric hospital ("Lag om rättspsykiatrisk undersökning," 1991; "Lag om rättspsykiatrisk vård," 1991; Socialstyrelsen, 1999).

1.2.2 Female offenders

As stated in the United Nations Universal Declaration of Human Rights (1948), the equal treatment of all individuals, regardless of race, gender, or religion is a cornerstone of most democratic jurisdictions. In the United States, figures from the Department of Justice show that women represent 18% of those under some form of correctional supervision, specifically 7% of prisoners and 25% of the probation population, and have a low probability of committing crimes or being arrested or incarcerated relative to men (Rivera & Veysey, 2014). Despite all persons being decreed as equal before the law, the overrepresentation of men within all parts of the criminal justice system and the traditional view of women as emotionally labile and incapable of logical thought or crime, has led to research and policy-making which, still today, is largely geared towards men (*Women in the Criminal Justice System: Tracking the Journey of Females and Crime*, 2015). Much of what is known about female offending is simply assumed by inferring it from that of men, which may be inadequate, as it is possible that there are real gender differences in criminogenic factors between men and women. As the number of women within the criminal justice system appears to be rising, incomplete knowledge of the mechanisms behind female offending may be seriously detrimental to future crime prevention (Cohen, 2015; Pollock, 2014). For example, studies have shown that women are less likely than men to be reconvicted within the first few years after discharge from prison (Maden, Skapinakis, Lewis, Scott, & Jamieson, 2006) but that the gender gap is narrowed by mental illness (Chang et al., 2015; de Vogel & de Ruiter, 2005) to such an extent that e.g. Putkonen, Komulainen, Virkkunen, Eronen, and Lönnqvist (2003) found female forensic psychiatric patients' risk of violent recidivism to be similar to that of male patients. Such gender-specific findings may have serious implications for how assessment and treatment of violent offenders should be carried out and call for additional research into the relationship between gender and crime.

1.2.3 Intimate partner violence (IPV) offenders

During the last several decades, violence against women has been in focus both nationally and internationally. In the early 1990s, the United Nations (1993) made a Declaration on the Elimination of Violence Against Women. In a recent report (World Health Organisation, 2013) it has been estimated that, worldwide, 30% of women who have been in a relationship

have experienced physical or sexual IPV, and intimate partners commit 38% of all murders of women. Women who have been subjected to IPV report higher rates of psychological and physical health problems. In Sweden, approximately 22,000 cases of assault against women are reported to the police every year, the majority of which involve IPV, making it the most frequently reported type of violence against women (Belfrage & Strand, 2012). IPV has been the focus of several national interventions initiated by the Swedish government. Infringement of women's rights was made a criminal offence in 1998, and a national centre for women's rights was created in 2006. A government report has recently been published on a long-term national strategy for men's violence against women and honour related violence and oppression. It outlines eight goals for e.g. improving knowledge, skills, and research; protection, support and treatment of victims; interventions for perpetrators (Statens Offentliga Utredningar, 2015). IPV has been described as a type of crime with a high rate of recidivism (between 25% and 50% in some studies) and revictimisation, and a considerable proportion of IPV victims report having been subjected to violence over a long period of time (Henning, Martinsson, & Holdford, 2009; Nicholls, Pritchard, Reeves, & Hilterman, 2013). For example, in a Swedish Prison and Probation Service sample of convicted IPV offenders (included in the study between 2004-2007), 19% had been reconvicted of IPV within a 4-7 year period (before march 2011). It follows that a way of reducing the burden to individuals and society caused by IPV is to prevent reoffending (Haggård, Freij, Danielsson, Wenander, & Långström, 2015).

One of the most internationally cited models of IPV offending, as well as most replicated method of IPV offender treatment, is the one outlined by the Domestic Abuse Intervention Program from Duluth, Minnesota (Pence & Paymar, 1993). It is based on experiences collected from IPV victims, police, and social services and postulates that a male IPV perpetrator's violence stems from gender inequality, stereotypes, and his need to gain power and control over his female partner. Despite criticism stating that it is an out-dated, overly feminist view of IPV, the Duluth Model can be seen as having laid a foundation for future IPV research, victim support, and offender treatment (Gondolf, 2010). The principal argument against the Duluth Model view of IPV is based on the reported use of violence by women in intimate relationships which, in many incidence studies, is higher than that by men and the prevalence of violence in non-heterosexual relationships (Dutton & Nicholls, 2005; Nowinski & Bowen, 2012). In their article on understanding the nature and aetiology of IPV, Dixon and Graham-Kevan (2011) examine the main theoretical frameworks for IPV and conclude that there is little support for a solely patriarchal or gendered conceptualization of IPV, but that patriarchy is one factor among many. Multifactorial explanations of IPV range from personality profiles and history of childhood aggression to marital dissatisfaction and life stresses, most of which are gender neutral and are applicable to both male and female perpetrators of IPV. Some examples of this type of research are studies of IPV perpetrator typologies that divide IPV offenders into different personality profiles (Fowler & Westen, 2010; Marshall & Holtzworth-Munroe, 2010). Other examples are neurobiological IPV research that has indicated that violent husbands misinterpret wives' behaviours and statements and may be hyper-responsive to mildly threatening provocation (Lee, Chan, & Raine, 2009; Marshall & Holtzworth-Munroe, 2010). This is postulated to be due to a deficit in the ability to activate the cerebral neuronal circuits involved in empathy (de Vignemont & Singer, 2006), which, in turn, may be caused by a compromised neural system underpinning

social information processing and deficits in the ability to recognise and process emotional cues given by others, such as fear (Corden, Critchley, Skuse, & Dolan, 2006; Marsh & Blair, 2008). Dixon and Graham-Kevan (2011) stressed the importance of preserving a multifactorial perspective and not to limit research into IPV offending (and subsequent interventions and preventative measures) by applying a single theoretical framework such as the one that all violence against women arises from gender inequality in society (Statens Offentliga Utredningar, 2015).

1.3 ASSESSMENT OF OFFENDERS

Offenders are assessed in several different ways during a Swedish court process and during their stay within the Prison and Probation Service or forensic psychiatry. For example, the court's decision as to whether or not an offender should be remanded in custody awaiting trial is partly based upon an assessment of risk of criminal recidivism, and most offenders who commit a violent crime are assessed by the Probation Service to determine their suitability for a probationary sentence such as community service (a violence risk assessment may be included). During the trial, a general or forensic psychiatrist may perform a preliminary (or minor) forensic psychiatric assessment upon which the court may base their request for a major (or large) forensic psychiatric assessment (henceforth referred to as forensic psychiatric assessment) to be performed by a forensic psychiatrist, which includes an assessment of the offender's mental state but also of recidivism risk. Within the prison system, an assessment of risk of violence is included when deciding in which unit to place an offender and, among those serving a life-sentence, a risk assessment is performed in conjunction with application for release. If sentenced to forensic psychiatric care, an offender is subjected to risk assessments at least every six months and e.g. upon requesting privileges such as leave to walk around the premises unescorted or upon application to the court to be discharged from care ("Brottsbalken," 1962; "Lag om rättspsykiatrisk undersökning," 1991; "Lag om rättspsykiatrisk vård," 1991; "Lag om särskild personutredning i brottmål, m.m.," 1991; Socialstyrelsen, 1999).

The types of assessments of offenders with which this thesis is directly concerned are the following: forensic psychiatric assessment of offenders' mental health, performed pre-sentencing, general assessments of risk of future violence among violent offenders within forensic psychiatric care, and specifically among intimate partner violence (IPV) offenders within the Prison and Probation Service.

1.3.1 Forensic psychiatric assessment

In Sweden, the National Board of Forensic Medicine, overseen by the Department of Justice, performs all forensic psychiatric assessments on behalf of the criminal courts. The board was created in 1991, with a view to standardising assessment within the specialties of forensic medicine, forensic chemistry, forensic genetics and forensic psychiatry ("Lag om rättspsykiatrisk undersökning," 1991). When a forensic psychiatric assessment is ordered during a criminal trial, by any criminal court in the country, it is performed at one of the two forensic psychiatric assessment units located in Stockholm and Gothenburg. If an offender is remanded in custody, the assessment is performed on one of the wards during a maximum of four weeks, if not, it is completed on an "outpatient" basis within six weeks. A forensic

psychiatrist is responsible for the forensic psychiatric court report based on material submitted by the other members of a multidisciplinary team, comprising a psychologist, a forensic social worker, and ward staff. The following questions are routinely posed to the forensic psychiatric team by the criminal court:

- 1) Was the offender under influence of an SMD at the time of the offence?
- 2) Is the offender suffering from an SMD at the time of the assessment, and, as a result, in need of compulsory forensic psychiatric care?
- 3) Does the offender have a risk of serious criminal recidivism?

The National Board of Forensic Medicine also has a role in research regarding offenders and forensic practice (including the role of mental illness in crime, violence risk assessment, the search for biomarkers of criminality) and has close links with several academic institutions. The records kept at the National Board of Forensic Medicine, are often, with the appropriate ethical permission, used for audit and research purposes ("Brottsbalken," 1962; "Lag om rättspsykiatrisk undersökning," 1991; Socialstyrelsen, 1999).

With regard to gender in forensic psychiatric assessment, female offenders are fewer in number as compared with their male counterparts (e.g. approximately 10% of the 500 offenders per year who undergo forensic psychiatric assessment in Sweden are female), but they are more likely to be declared legally insane (or the equivalent thereof) and receive forensic psychiatric treatment. From the United Kingdom, Coid, Kahtan, Gault, and Jarman (2000) and Menzies, Chunn, and Webster (1992) describe that female accused are proportionately more likely to be subjected to a forensic psychiatric evaluation and to receive a psychiatric disposal at court compared with men. Furthermore they argue that women are treated more leniently than men, by forensic clinicians and by the courts, for similar offences against person and property. A study of 1102 fitness to stand trial assessments in Quebec showed that women were twice as likely as men to be recommended unfit to stand trial, even when age, severity of the offence, signs of psychosis, and history of criminal convictions were controlled for (Crocker, Favreau, & Caulet, 2002). A Swedish study of all offenders subjected to court-ordered forensic psychiatric inpatient assessment between the years 1992–2000 (4,396 subjects) showed an increased likelihood that female violent offenders would be declared legally insane (found to have an SMD) compared with males, even after controlling for a number of potential confounders (Yourstone, Lindholm, Grann, & Fazel, 2009).

It is possible that the findings above are due to a higher proportion of mental illness among female compared with male offenders. Indeed, studies have found that female offenders have had more contact with psychiatric services prior to the offence compared with males (Coid et al., 2000; Holmberg & Kristiansson, 2006), and Sturup and Kristiansson (2007) found evidence of a lower level of functioning among female offenders as compared with male offenders referred for forensic psychiatric assessment, as reflected by lower Global Assessment of Functioning scores at the time of the assessment. However, it has also been postulated that gender bias is at the root of female offenders being more likely to receive forensic psychiatric treatment than males (Menzies et al., 1992; Yourstone et al., 2009). Previous studies of forensic psychiatrists and judges have found a large degree of discrepancy between individual assessors, and that forensic psychiatrists were significantly more likely to

assess a fictitious perpetrator of murder as seriously mentally disordered if its gender was presented as female (Belfrage & Lidberg, 1996; Yourstone, Lindholm, Grann, & Svenson, 2008). It has also been postulated that this may vary based upon the nature of the mental disorder involved e.g. psychosis or personality disorder (Coid et al., 2000; Grann & Holmberg, 1999; Riley, 1998).

1.3.2 Violence risk assessment of offenders

Within forensic psychiatry in Sweden, the National Board of Forensic Medicine carries out formal assessments of recidivism risk during court ordered forensic psychiatric assessments and, when undergoing forensic psychiatric treatment, an offender's risk of violence is assessed on a regular basis, particularly before changes in privileges, such as being granted leave, or before discharge is considered. Within the Prison and Probation Service, a probation officer often performs a formal risk assessment when giving the court an opinion on the suitability of a probationary sentence e.g. using the Brief Spousal Assault Form (Kropp, Hart, & Belfrage, 2005) if the index offence concerns IPV. Male offenders who have been sentenced to more than four years in prison (and female offenders with a sentence exceeding two years in prison) are subjected to a formal risk and needs assessment, at a special assessment unit in Kumla or Hinseberg Prison respectively, before being allocated a place within the prison system (Kriminalvården, 2015b). Among those serving a life-sentence in prison, the National Board of Forensic Medicine performs a formal violence risk assessment during their appeal for release.

Many researchers and clinicians in the field of violence risk assessment have described the importance of, and difficulties inherent in, performing such assessments (Bonta, 2002; Dolan & Doyle, 2000; Yang, Wong, & Coid, 2010). In Sweden, the exact methods to be used for violence risk assessment are not dictated by clinical guidelines but mirror the international literature, which describes that it is common to use a combination of clinical judgment and different structured, standardized risk assessment tools, such as the History, Clinical, Risk Management - 20 (Webster, Douglas, Eaves, & Hart, 1997) and Psychopathy Checklist - Revised (Hare, 2003) is common. These tools appear to be largely interchangeable with each other and, at best, have been found to reach a moderate level of accuracy in predicting violence. Researchers suggest that they should not be used alone for decision-making within the criminal justice system (Campbell, French, & Gendreau, 2009; Walters, 2006; Yang et al., 2010). From their meta-analytic study of violence risk assessment methods, Singh, Grann, and Fazel (2011), qualify the conclusion above with the observation that a risk assessment tool appears to be at its most efficacious in predicting future violence when used in the specific group for which it was designed. This is supported by the argument that different risk factors may be of different significance within different populations, e.g. the role of mental illness appears to differ when applied to the general population compared with offenders and to female compared with male offenders (Alm et al., 2010; Chang et al., 2015).

Methods have been brought forth to improve on predictive validity of the risk assessment methods described above e.g. by adding neurobiological risk factors such as genetic and pre-natal environmental factors (van der Gronde, Kempes, van El, Rinne, & Pieters, 2014). Douglas and Skeem (2005) outlined that future empirical investigation of changeable or dynamic risk factors (such as impulsiveness, antisocial attitudes, interpersonal relationships)

was necessary in order to improve the assessment of violence risk. A few years later Skeem reiterated that advances in risk assessment could be made through exploring new assessment methods, rather than trying to improve upon older, structured assessment tools (Skeem & Monahan, 2011). This has already been employed in several ways such as including informed deception detection strategies in risk assessment (Baker, Porter, ten Brinke, & Udala, 2015), considering the role of anger and thinking styles (Low & Day, 2015), creating a Bayesian network model as decision support for violence management of prisoners (Constantinou, Freestone, Marsh, Fenton, & Coid, 2015), and using a computer program to assess readiness for discharge from secure forensic psychiatric settings (Hodge et al., 2015).

1.4 TREATMENT OF VIOLENT OFFENDERS

In 1555, the Bridewell House of Corrections, which may have been the world's first correctional facility, was opened in London for the punishment and improvement (through labour) of its inmates. In the 1864 Swedish penal code, prison became the primary form of punishment and the first probation service-like organization was formed in 1910. The present Swedish penal code, passed in 1965, is based on the principle that an individual offender is to receive treatment so as to be able to adapt to life in society and also involves general prevention. Following intense criticism regarding disproportion between crime and punishment (due to differences in offenders' alleged treatment needs), the penal code was reformed in 1989, emphasizing that a crime should be punished in proportion to its penal value and culpability, enabling greater equality before the law (Ekblom, Engström, & Göransson, 2011).

1.4.1 Forensic psychiatric care

One of the founders of Swedish forensic psychiatry described the difficulties he observed, in the 1950s, in finding adequate placements for MDOs in the following way: "if... placed in asylums organized for the treatment of the classical psychosis they are often very embarrassing owing to their great number, their lucidity and their intriguing, subversive and antisocial attitudes. Therefore, in Sweden we are preparing to organize special medical establishments for this clientele, so far homeless... Some of them are placed in "Security Establishments" as dangerous. A few are declared exempt from punishment and interned in special wards at certain mental hospitals. None of these treatments are adequate" (Kinberg, 1953).

In Sweden, modern forensic psychiatric care is given in clinics run by the county councils. The psychiatrists who treat these patients may be specialists in general or forensic psychiatry. The focus of this forensic psychiatric care is often the treatment of mental illness (including substance abuse), social skills training, and procuring work and suitable living arrangements, as these are a prerequisite for discharge. There are no nationwide treatment programs specifically aimed at particular criminal behaviours in the same way as programs within the Prison and Probation Services, such as the IDAP program for IPV offenders (Kriminalvården, 2006). It is likely that wide implementation of specific treatment programs is hampered by factors such as large individual variations in psychiatric symptomatology, which is likely to interfere with group treatment sessions. Unlike in the Prison and Probation Service, patients are not placed according to offence category which may result in only a few individuals with

a similar index offence being treated in one geographic location at any one time, making treatment programs aimed at specific types of offences difficult (Kriminalvården, 2015c). The National Forensic Psychiatric Quality Register was created in 2003 in order to collect material for audit and research purposes from all forensic psychiatric clinics, thus contributing to the provision of humane and safe forensic patient care. Examples of quality indicators included in the register are general health, criminal recidivism during on-going care, percentage of patients with a body mass index over 30, and percentage of patients with improved symptomatology. More research into treatment factors, which may improve the experience and outcome of forensic psychiatric care, and how to implement them, is required (Hörberg, Sjögren, & Dahlberg, 2012; Mezey, Kavuma, Turton, Demetriou, & Wright, 2010). For example, Glorney et al. (2010) have presented a new clinical model applied at Broadmoor Hospital, London, comprising eight domains of need of a patient in forensic psychiatric care (e.g. therapeutic engagement, risk reduction, education, occupational) and how these can be met in order to “provide a comprehensive and streamlined pathway through a high secure hospital”.

1.4.2 The Prison and Probation Services (“Criminal Care”)

The direct translation of the Swedish Prison and Probation Service’s Swedish name (Kriminalvården) is “Criminal care”. Today, the Swedish Prison and Probation Service is a part of the Department of Justice and is divided into remand prisons, prisons, probation offices and a transport service. The current Swedish Prison law was passed 2011 and states that an offender’s term in prison should be tailored to the individual’s capacity and needs and a written plan must be drawn up for each offender. Included in this plan is a description of the programs, which are deemed suitable for a given offender. A program within the Prison and Probation Service is defined as structured activities such as work, education, and treatment programs which give the offender the opportunity to learn new skills and change behaviour to prepare for a successful release. Participation in treatment programs within prisons is voluntary, but an offender sentenced to probation may be mandated to attend a specific treatment program as part of his/her sentence. Such treatment programs are evidence-based and have been subjected to an accreditation process by a scientific panel during which their potential to reduce recidivism is assessed (Ekblom et al., 2011). Of those released from prison in 2014, 32% had taken part in at least one of the 14 available treatment programs. Out of those who completed a probationary sentence during the same year, 36% had taken part in a treatment program. In total, almost 8,000 offenders completed treatment programs within the Prison and Probation Service in 2014 (Kriminalvården, 2015a). The Integrated Domestic Abuse Programme (IDAP), described below, is one such treatment program.

1.4.2.1 Treatment of IPV offenders

In Sweden, IDAP is the treatment of choice for men convicted of intimate partner violence, and it has been used within the Prison and Probation Service since 2004. It was translated into Swedish from the British IDAP programme, which, in turn, had been adapted from the American Domestic Abuse Intervention Project, part of the Minnesota-based Duluth Model. IDAP is taught to groups of 6-8 male offenders by specially trained male and female prison/probation officers, during a 27week period. It is based on cognitive behavioural therapy, social learning theory, and the power and control model which is used to explain

men's violence against women in abusive relationships (Kriminalvården, 2006; Pence & Paymar, 1993). To examine the efficacy of IDAP in Swedish prisons, researchers affiliated with The Swedish Prison and Probation Service have recently published a longitudinal controlled cohort study of 340 prisoners who consecutively began IDAP between 2004-2007 and were followed up until 2011. According to their data, obtained from the National Crime Register, 25% of IDAP participants, versus 23% of controls, recidivated in any violence and, in both groups, 19% reoffended in IPV specifically. It was concluded that the lack of effective IPV treatment was "frustrating" and that further research and development of treatment methods was called for (Haggård et al., 2015).

Types of IPV treatment other than those based on the Duluth model, are gender neutral cognitive-behavioural therapy groups and couples treatment. However, international research in the area of IPV offender treatment mirrors the above findings from Swedish IDAP, regardless of treatment method. Several reviews of domestic violence treatment show that current interventions, including those based on the Duluth model, have minimal impact on reducing recidivism (Babcock, Green, & Robie, 2004; Davis, 2015; Smedslund, Dalsbø, Steiro, Winsvold, & Clench-Aas, 2007; Stover, Meadows, & Kaufman, 2009). However, Babcock et al. (2004) argued that these interventions should not simply be abandoned. Instead, as no one treatment method was proven superior to the others, further research should be conducted and components added to the existing interventions, which may also be tailored to specific clientele.

1.4.3 The need for simulation in forensic psychiatry and the prison and probation service

As described at length above, offenders are a diverse group and can be classified into many different, often overlapping, subgroups, depending on one's perspective and purpose. The classifications used in this thesis (mental illness, gender, and type of crime) are common in violence research. They serve as groups for generating and assessing hypotheses with a view to uncovering for e.g. risk factors or treatment methods, with the ultimate goal of reducing the burden of violent crime on society and within the lives of individual offenders and victims. According to these classifications, areas in which conventional assessment and treatment methods may be improved upon have been identified e.g. forensic psychiatric assessment of female offenders, violence risk assessment of MDOs, and treatment of IPV. This thesis has paired this offender research with research in the field of case and computer simulation for assessment, training, and teaching. It takes advantage of a simulation's unique ability to showcase the user's preconceptions and initial skills and to teach new ones, by allowing him/her to interact at their own pace with a reproducible, safe, and often engaging replica of the real world. This thesis applies simulation techniques to 1) explore the effect of gender on forensic psychiatric professionals' assessments of violent offenders (study I), 2) assess the reactions of violent MDOs compared with controls using a computerised risk simulation program (study II), 3) create and pilot-test a risk simulation treatment program for IPV offenders (studies III and IV).

1.5 SIMULATION

“Simulation, in industry, science, and education (is) a research or teaching technique that reproduces actual events and processes under test conditions... Simulation implements (or simulators) range from paper-and-pencil and board-game reproductions of situations to complex computer-aided interactive systems” (Simulation, 2015).

P. Bradley (2006), observes that the history of simulation stretches back through the centuries. He cites the game of chess and the practice of jousting as early forms of war simulation, beginning a military tradition of being forerunners in the use and development of simulation. Modern simulations expose the user to a controlled context which mimics real-life but lets him/her practice behaviours or judgements in an environment that is safe for all involved. Simulations are used in such varying areas as finance, aviation, nuclear disaster management, and modelling consequences of climate change (Bell, Kanar, & Kozlowski, 2008; P. Bradley, 2006; van Vuuren et al., 2011). For example, within healthcare, different forms of simulation and simulators have been used in education, research, skills training, and psychiatric treatment. They have taken forms as varied as written case vignettes, plastic resuscitation training dolls, virtual patients (VPs), and interactive virtual therapists (Bergstrom et al., 2010; P. Bradley, 2006; A. A. Rizzo & Kim, 2005; Schultheis & Rizzo, 2001; Zary, Johnson, Boberg, & Fors, 2006).

In research, there is often a conflict between ecological validity and experimental control. Within the fields of neuroscience and psychological/psychiatric research, clinicians and therapists often choose to make naturalistic observations of behaviour in a real environment, which is inherently complex and hard to control. Researchers may choose abstractions of real-life situations to control for different variables e.g. through creating test-, graphical, or computer-based environments. A middle way is to create realistic scenarios, or simulations, in which one also may control for different variables (Bohil, Alicea, & Biocca, 2011). This thesis utilizes traditional, “paper and pencil” case simulation, using written cases, to investigate gender bias among in forensic psychiatric assessors (study I) and moves on to use interactive computer simulation in two contexts; the augmentation of assessment of mentally disordered violent offenders within forensic psychiatry (study II) and the assessment and treatment of IPV offenders, a specific offender subgroup within the prison and probation services (study III and IV).

1.5.1 Use of written case vignettes in different contexts

Jeffries and Maeder (2005) describe a vignette as a type of story, which, for the last 50 years, has been used in science and education as a method for modelling, teaching, and researching behaviour and understanding. A case vignette can be presented in several different modalities e.g. written text, a verbal description or a video recording. In his vision for the future of medical education, Henderson (1998) points out that storytelling via cases greatly enhances the learning cycle, as “cases are richer in features than rules, more richly indexed in memory, easier to modify and adapt to new situations, and thus easier from which to learn”. When used in research, a particular strength of the case vignette is that it provides a way of addressing sensitive topics in real life situations, which can otherwise be difficult to explore. For example, the case vignette method of research has frequently been used to study attitudes

or bias particularly with regard to gender and ethnicity. According to this method, two sets of a case vignette (or short description of a person or situation), identical except for the variable of interest, are randomized and presented to the study participants. The individual opinions or judgments about the case are recorded and grouped according to which set the participant was given, and a statistical comparison is made between the two groups (Atzmüller & Steiner, 2015; Butrick et al., 2011; Mikton & Grounds, 2007). For example, Aspinwall, Brown, and Tabery (2012) recently used the case vignette method within the judicial system among 181 U.S. state trial judges. It was found that expert testimony concerning a biomechanical cause of a convict's degree of psychopathy significantly reduced the extent to which psychopathy was rated as aggravating and significantly reduced punishment. Bearing in mind its strengths as a research method, previous research on the characteristics, forensic psychiatric assessment, and violence risk assessment of female offenders, the case vignette method was selected to explore the role of gender in forensic psychiatric assessment, which corresponds to study I in this thesis. The creation of the case vignettes used in the study is described in the methods section of this thesis, under study I (section 3.2.1).

Written (paper-and-pencil), spoken, or recorded case vignettes, used in e.g. teaching and training, inherently involve a one-way exchange of information between the teacher and learner and can only progress in a linear, pre-determined fashion (Henderson, 1998; Poulton, Conradi, Kavia, Round, & Hilton, 2009; Zary et al., 2006). During recent decades, despite still being extensively used in their original form, traditional case vignettes have been supplemented by the addition of computer technology. This has resulted in the interactive computer simulation systems now used in a multitude of contexts and is described at length below.

1.5.2 Computer simulation for training, treatment, risk assessment

In their book *On How People Learn*, Bransford, Brown, and Cocking (1999) argue that the three core learning principles, distilled from research on the science of learning from the late 19th onwards, are the following: a learner's preconceptions of a subject must be drawn out and worked with or he may fail to grasp the new concepts being introduced or revert to old preconceptions once the lesson is over; when a subject is taught in depth, many examples must be provided of the concept at work; metacognitive skills should be taught alongside the subject matter. Interactive simulation technology is particularly conducive to enhancing learning and training, as a computer simulation program can be designed to target each of these areas. A subtype of computer simulations are also called serious games, as they share many qualities with commercial games, but are used for e.g. teaching, training, and assessment, not primarily for entertainment (Breuer & Bente, 2010). In such a program, the learner uses preconceptions to interact with the system, practices new concepts in a safe replica of the real world, and receives feedback that can be used for further practice or analysis. A computer simulation can also be used for isolated parts of this process such as mapping the user's preconceptions, i.e. performing an assessment, by observing his/her reactions in a replica of the real world (Parsons & Reinebold, 2012; A. Rizzo et al., 2011; Silverberg et al., 2011). Computer simulations have been demonstrated to be good technical aids for activating, motivating and emotionally engaging users. This contributes to the possibility of building knowledge, a better understanding of the simulated experience, better confidence in one's problem-solving skills and better memory retention (Bergin et al., 2003;

Courteille, 2008). Furthermore, simulations have a unique ability to create potential for teaching and instruction and can be used to create a realistic world in which users are exposed to different contextual factors and practice behaviours that would be too dangerous or rare to experience in real life (Bell et al., 2008). In an analysis of the use of virtual reality in rehabilitation and therapy, A. A. Rizzo and Kim (2005) summarised the advantages of computer simulation in the following way: ecological validity is enhanced; stimuli can be controlled and kept consistent; real-time feedback is given to the user and a performance record is available for analysis; the environment is reproducible, easily distributed, safe and can be explored at the user's own pace; the user's motivation and engagement can be enhanced using features taken from commercial games e.g. pacing of stimuli and rewards. In a meta-analysis of cognitive and motivational effects of serious games, Wouters, Van Nimwegen, Van Oostendorp, and Van Der Spek (2013) have quantified these advantages by examining the results of 39 studies, involving a total of 5,547 participants, comparing computer simulations/serious games to conventional instruction methods (e.g. active instruction through exercises or passive instruction through lectures). The authors conclude that serious computer games are more effective in terms of learning ($p < 0.01$) and retention ($p < 0.01$) than conventional instruction methods but were not found to be significantly more motivating ($p > 0.05$).

1.5.2.1 Neurocognition and psychophysiology in computer simulation

In research on the interaction between computer and user, Fairclough, Gilleade, Ewing, and Roberts (2013) argue that engagement is a psychological process integral to the performance of a computer task. Task engagement is described as consisting of cognitive activity (mental effort), motivational orientation (approach vs. avoidance), and affective changes (positive vs. negative valence). A certain degree of autonomic arousal is necessary for attention and stimulus processing, mental effort, motivational orientation, and emotional or affective changes, which are important components of learning and memory (Gorringo, Chevalier, Goldfarb, Hoepfner, & Birnbaum, 2014; Kahneman, 1973; Sara & Bouret, 2012). The autonomic nervous system is controlled by central autonomic nuclei within the brainstem and cerebellum and produces cardiac and peripheral vascular response patterns required to carry out behaviours. These response patterns are elicited by exercise, mental effort and emotional states. For example when a person is in an emotional state of fear, he/she experiences increased heart rate, sweating and blood flow to skeletal muscle, which physiologically serves to enable him/her to protect himself/herself by e.g. running away from the fear-causing stimulus. These response patterns can be objectively measured in several ways (see section 1.5.2.2). They are important for learning and influence decision-making and emotional behaviour (Critchley, Corfield, Chandler, Mathias, & Dolan, 2000). However, arousing states with negative valence are known to constrict perceptual and conceptual attention and result in task performance decline (Friedman & Förster, 2010; Sarter, Gehring, & Kozak, 2006) which is damaging to the learning process. In their experiments with an intelligent tutoring system, D'Mello, Picard, and Graesser (2007) found that, while emotions are tightly linked to the learning process, emotions such as boredom, confusion, delight, flow and frustration, rather than Ekman's basic emotions (anger, fear, happiness, sadness, disgust, and surprise), mediate deep conceptual learning. In their model of computer gaming, motivation and learning, Garris, Ahlers, and Driskell (2002) describe that learning outcomes of an instructional

computer program are dependent upon instructional content, game characteristics, user judgment and behaviour, and system feedback. It follows that an instructional computer simulation should beware of content and characteristics that elicit strong negative arousing states in order not to hamper learning. It may also be important for an instructional computer simulation not inadvertently encourage the “wrong” kind of learning e.g. disinhibition and desensitisation to violence, which is a possible ethical criticism of violence simulation. Studies of players of commercial first person shooter video games have shown self-reported and physiological arousal, feelings of positivity and being in control, and dominance while playing the violent video games. Furthermore, arousal was shown to decline over time, a phenomenon which has been linked to disinhibition and violence desensitisation and which may be prudent to avoid when designing a serious game for assessment, training or teaching purposes (A. Lang, Bradley, Schneider, Kim, & Mayell, 2015; Media Violence Commission, 2012).

1.5.2.2 Psychophysiological measurement in evaluation of simulation and serious games

There are several ways to reveal the psychological reactions of a user of a computer simulation or game, e.g. through the interpretation of facial expressions and verbal signals, measuring the physical strength with which the user interacts with the equipment, or self-report via questions about how the user is feeling. Fairclough and Moores (2007) argue that psychophysiological markers, such as skin conductance, hold many advantages over other methods when studying emotional recognition. Changes in psychophysiological markers can be measured during a whole simulation session and are part of a continuum. They are implied and covert and therefore not subject to social convention in the same way as facial or verbal expressions. For example, self-report questionnaires are dependent upon the user being consciously aware of his/her feelings, being able to interpret them and remember them when recording the verbal answer and not editing them to make them more socially acceptable. The results of such questionnaires often correspond poorly to psychophysiological activity. Interpretation of psychophysiological data does create certain difficulties, as the relationship between the variables is not pure. For example, the pattern of autonomic activation displayed by a frustrated computer-user (e.g. elevated systolic blood pressure) can be the same as when the user experiences a positive challenge (Cacioppo & Tassinary, 1990). Observing several different modalities can increase the validity of the interpretations of psychophysiological measurements, and subjective self-report, despite several disadvantages, is the best way of interpreting physiological data in relation to the individual’s private psychological experience (Fairclough, 2009).

Among the most frequently used psychophysiological methods for assessing autonomic activity in the context of watching film clips, using a computer simulation, or playing a serious game are the skin conductance level (SCL) component of the galvanic skin response (GSR; in layman’s terms, sweating) as well as heart rate (HR; or pulse) (Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, 2013; Choi et al., 2011; Fernandez et al., 2012; Kivikangas et al., 2011; Parsons & Reinebold, 2012). Change in SCL is a measure of the change in tonic level of electrical skin conductivity over time. This makes change in SCL a suitable measure of arousal during a computer simulation or the viewing of a film clip lasting tens of seconds to several minutes. In contrast, when a discrete stimulus, such as a single picture, is shown, various measures of the short, rapid phasic increase in skin conductance

(skin conductance response, SCR) are often chosen instead (Dawson, Schell, & Filion, 2007; Figner & Murphy, 2011).

1.5.2.3 Computer simulation in medicine and health care

In a history of the use of simulation in medical education, Owen (2012) describes early use of medical simulators in the form of dolls used for practicing acupuncture in 11th century, and 18th century obstetric simulators that leaked blood and amniotic fluid. P. Bradley (2006) describes the resuscitation dolls “Resusci Anne” made by Norwegian toy maker Laerdal in collaboration with anaesthetists in 1960, as one of the first uses of simulators in modern medical education. As many first-aid-trained persons can testify, the dolls are still very much in use today and have become more technologically refined. In the 1980s, groups at Stanford University and University of Florida developed crisis simulations using manikins for team-based training in anaesthesia, based on models of flight crew training in the aviation industry. They are still in use in moderate to high-fidelity training simulations today. The need for improved clinical skills training of medical students and specialists continuing medical education drove the development of simulation in health care during the latter part of the 20th century. Simulations can be classified into part-task trainers, computer-based systems, and integrated simulators. A type of computer simulation developed over the last 50 years has used simulated patients (or VPs) for education. One of the earliest examples were a series of computerised physiological models (e.g. “McPee” for renal physiology, “McPuff” for respiratory physiology and “McDope” for pharmacology), used at McMaster University in the late 1960s/early 1970s, with which medical students could interact by typing clinical questions or suggesting treatments and receiving written feedback, on screen, about the effects of their interventions (Neufeld & Spaulding, 1973). A more comprehensive simulation was CASE (Computer-Aided Simulation of the clinical Encounter) which involved the user assuming the role of physician and interacting with the computer by typing e.g. free text questions common in medical history taking or requesting results of different clinical examinations and blood tests and receiving written feedback (Harless, Drennon, Marxer, Root, & Miller, 1971). More recent VP simulations may show film clips of a professional actor presenting a case history or be computer animated (P. Bradley, 2006). An example is the VP simulation program Interactive Simulation of Patients (ISP), developed at Karolinska Institutet, in which the learner (a medical student) interacts with the simulated patient via a computer keyboard, taking a clinical history, choosing from hundreds of laboratory tests and clinical procedures, and receiving feedback on his/her performance (Bergin et al., 2003). Recent development of VPs for training have included computer-animated patients with whom the user interacts using speech-recognition software (Kenny, Parsons, Gratch, Leuski, & Rizzo, 2007; Pataki et al., 2012). VP technologies have emerged as promising tools in education of healthcare providers and they have been shown to be superior to traditional teaching methods, such as paper based cases, in terms of learning outcomes (Botezatu, Hult, Tessma, & Fors, 2010; Consorti, Mancuso, Nocioni, & Piccolo, 2012). They have also been developed for assessing, educating, and treating patients (or potential patients) in areas such as post-traumatic stress disorder, dementia, treatment of phobias, and eating disorders (Bergstrom et al., 2010; Kenny, Parsons, Gratch, & Rizzo, 2008; Pantziaras, Fors, & Ekblad, 2015; A. A. Rizzo & Kim, 2005; Silverberg et al., 2011). This can take the form of an animated, virtual therapist asking the user questions about post-traumatic stress and

recommending an action such as contacting his/her health care provider (A. Rizzo et al., 2011). In the area of forensic psychiatry, these technologies have been developed for the assessment and treatment of specific disorders e.g. by creating a fully immersed virtual reality environment in which a paedophile can interact with a virtual child (Benbouriche, Nolet, Trottier, & Renaud, 2014; Renaud et al., 2010). Simulations, some of which are forerunners or developments of the research presented in this thesis, have been created with a view to assessing a forensic patient's readiness for discharge or risk of violence (Hodge et al., 2015; Wijk et al., 2009).

It should be mentioned that, in parallel with the development of VP technology and computer simulation described above, other forms of computerised technology are making an entrance into mainstream health care assessment and treatment. Entire internet-based treatment programmes have been developed for depression, social anxiety disorder, and irritable bowel syndrome, and are being used in clinical practice in Sweden (Hedman et al., 2011; Ljótsson et al., 2011; Stockholms Läns Landsting, 2015). An internet-based general practice has been created (Webhälsa AB, 2015). However, in Sweden, these treatments are based on text, e-mail communication, or video link with a treatment provider and do not, as yet, use interactive computer simulation or VP technologies.

1.5.2.4 Creating the RoD/FP

In 2008, forensic psychiatric and computer simulation expertise merged at Karolinska Institutet and developed a computer-based simulation framework, Reactions on Display (RoD), onto which different interactive scenarios can be grafted (Wijk et al., 2009). The first simulated scenario Reactions on Display/Forensic Psychiatry (RoD/FP) was designed to be used as a tool to clinically study, and possibly also rehabilitate, MDOs with psychosis or ASD treated in forensic psychiatric care (section 1.4.1). It was also designed to augment conventional violence risk assessment methods (section 1.3.2) by allowing clinicians to identify dynamic risk factors through observing patients' interactions within the simulated scenario. During the simulation, the patient chooses different actions, on behalf of a simulated main character, which are followed by reactions and consequences, all visualised in film clips. The patient is also requested to answer questions about the possible emotions, bodily sensations, and thoughts of the simulated characters. In the RoD/FP, the main simulated character is a man in his twenties living with his mother. She disturbs his morning routine by occupying their bathroom at the time at which he usually has his shower in order not to be late for work. The patient is given several options on how to deal with this situation, ranging from non-violent (e.g. asking his mother to hurry up and waiting in the kitchen) to violent (e.g. banging on the door and threatening her). The simulation allows patients to try out different possibilities and solutions thus gaining understanding of which behaviour is the most suitable. Keeping the target population in mind, the simulation interface was made as simple and consistent as possible, with only one task at a time to minimise the risk of cognitive overload. The film sequences had been scripted by the research group and were recorded by a film company using professional actors and real members of the local police force and criminal court. They were then grafted into the program that had been developed using Adobe Macromedia Authorware 7.0 Professional. The research group also developed the interactive questions regarding the characters' emotions, bodily sensations, and thoughts. Upon its completion, Wijk et al. (2009) performed a pilot study of the RoD system with 8

patients and 13 members of staff. Results showed that the interface and design were well received, the video sequences were interpreted as realistic, and the participants felt that the system was enjoyable to use. Based on these results of this pilot study, the research group deemed it meaningful and safe to carry out the intended study involving a larger number of patients with psychosis and ASD, which corresponds to study II in this thesis.

1.5.2.5 Creating the RoD/IPV

In 2008-2009, bringing together the research into computer simulation and learning (section 1.5.2.1) and the characteristics and treatment of IPV offenders (sections 1.2.1.3 and 1.4.2.1), the research group (comprising forensic psychiatrists, a probation officer and a simulations expert) created a RoD-based system (section 1.5.2.5) specifically designed for use in the treatment of perpetrators of IPV, known as RoD/Intimate Partner Violence (RoD/IPV). Its purpose is to facilitate change in the offender's violent behaviour by allowing him to, both visually and in written text, reflect upon common feelings, thoughts, actions, and consequences in a typical Swedish (and later a British) IPV case. Seven offenders, who had recently completed IDAP, took part in a small pre-pilot study of the RoD/IPV (Sygel, Fors, Furberg, & Kristiansson, 2010). A computer log of the simulation sessions and a questionnaire on the subjects' opinions of the program were analysed. Most of the participants found the system realistic, comprehensible and thought it could be useful in treating IPV. There were no indications that using the system negatively influenced the subjects, e.g. making them feel uncomfortable or upset by its contents, and thus it was deemed feasible to proceed with a larger controlled pilot study. The process of creating the RoD/IPV is further described in the methods section of this thesis, under study III (section 3.2.3), as the research group chose to incorporate this into the controlled pilot study of the RoD/IPV rather than publish it in a separate descriptive method paper.

1.5.2.6 Psychophysiological evaluation of the film content of the RoD/IPV

The development of the RoD/IPV is based on substantial clinical expertise in the field of assessment and treatment of IPV offenders. The level of violence depicted in the film sequences within the risk simulation was determined by the clinical judgment of the creators who wrote the preliminary script and instructed the director during filming and editing of the film clips. It was designed to illustrate the emotions, actions, and reactions of the simulated characters but stops short of explicitly showing the victim being raped or sustaining bodily injury. However, during the experiments in study III, it was noted that several participants winced or displayed other behaviours indicating aversion during the violent scenes depicted in the simulation and 44- 61% felt that they were "negatively affected" when using the simulation. Within the research group, this raised the question, of whether or not the violence shown in the simulation elicited a strong physiological stress response in the user, perhaps in the same way as stimuli used primarily to induce stress in psychological experiments such as the Stroop test (Renaud & Blondin, 1997) or International Affective Picture System (P. J. Lang, Bradley, & Cuthbert, 2008). Bearing in mind studies of stress and learning by computer simulation (sections 1.5.2.2 and 1.5.2.3) an issue in the design of the RoD/IPV simulation had been that it should not cause offence, great discomfort or disgust by depicting graphic physical and sexual violence leading to injury, which could hamper engagement with the program or with treatment altogether. Another critical aspect was that it should not be

able to be used to provide enjoyment or inspiration for violent acts, a possible ethical criticism of violence simulation, and a frequent criticism of commercial gaming, such as first person shooter games (section 1.5.2.2). Although results from study III already indicated that the RoD/IPV was well received and understood by the participants, no objective psychophysiological measurements had hitherto been made. Therefore, based on research into psychophysiological reactions in computer simulations and serious games, study IV was created and carried out to objectively explore if the level of violence depicted in the film sequences in the RoD/IPV simulation fell within an acceptable range for its use as an offender treatment and assessment tool.

2. AIMS

The overall aim of this thesis is to, via experimental techniques, introduce case and risk simulation in the assessment and treatment of violent offenders within forensic psychiatry and the Prison and Probation Service. Written case vignettes are used to study gender bias within forensic psychiatric assessment of offenders. A new, interactive computer simulation program has been created by the research group and has been preliminarily evaluated among offenders sentenced to forensic psychiatric care for violent crime and among offenders sentenced to probation or prison, specifically for IPV.

The specific aims were to:

- I. Experimentally gauge how those performing forensic psychiatric assessments in Sweden rate the presence of SMD, need for compulsory, in-patient forensic psychiatric care, and risk of serious criminal recidivism, depending on the gender and nature of psychiatric symptomatology of the offender.

- II. explore the ability of a new, interactive computer simulation system (RoD/FP) to differentiate between violent offenders with SMD and a control group.

- III. investigate how male offenders, convicted of IPV towards women, use and react to a new, interactive computer simulation system depicting domestic violence (RoD/IPV) and to determine if they differ from a non-offender control group in this regard.

- IV. further validate the RoD/IPV tool through mapping the psychophysiological reactions of controls to standardised segments of the RoD/IPV program.

3. PARTICIPANTS AND METHODS

3.1 PARTICIPANTS

A wide selection of individuals from the Swedish community have participated in the studies comprising this thesis, including forensic psychiatrists, psychologists, and social workers, recruited from Sweden's largest cities, and prison inmates, forensic psychiatric inpatients, and steel workers recruited from the small towns where these institutions commonly are located. The participants have also varied greatly in terms of educational background and intelligence measures. In all but study I, which comprised professionals performing forensic psychiatric assessments, and in which the effect of assessor gender was taken into account, the study participants have all been Swedish males raised in Sweden. In order to eliminate user gender and ethnicity as a confounder in the studies preliminarily evaluating the RoD/RP and RoD/IPV systems, Swedish male offenders and controls were selected as participants. As described above (see section 1.2.1.2), females are a minority group among violent offenders and may significantly differ from male offenders in many ways, e.g. have different risk factors and recidivism rates, thus gender would have to be controlled for in any mixed gender study of offenders. The relationship between ethnicity and violent offending is a major area of study within criminology; however, it is deemed outside of the scope of this thesis. While mixed-gender and mixed-ethnicity studies of the simulation systems would have been highly relevant and are important areas for future study, they would have required a far larger total number of participants than was possible to recruit for these particular studies, due to financial and time constraints.

3.1.1 Study sample in study I

This was a study involving the total population of forensic psychiatrists, psychologists, and social workers employed by the National Board of Forensic Medicine to perform forensic psychiatric assessments on behalf of the Swedish courts on the day of the study. In total, 72% (n=26 assessors) of the 36 fully qualified assessors belonging to these professions, and who were deemed eligible to participate in the study, actually took part (13 assessors from each one of the two departments, Gothenburg and Stockholm). Trainees, assessors on long-term leave from the workplace on the day of the experiment (e.g. on parental or sick leave), and those who had participated in the design of the study were deemed ineligible for participation. All other forensic psychiatrists, forensic psychologists, and forensic social workers employed at the two units were asked to participate (n=36, 19 women and 17 men). There were several reasons for non-participation among those deemed eligible, such as short-term sick leave, unalterable professional or personal engagements on the day of the study, or unwillingness to participate for any other reason. Out of the 26 participants, 16 (61.5%) were female and 10 (38.5%) male, 10 were forensic psychologists, 8 forensic social workers, 6 forensic psychiatrists, and 2 persons chose not to divulge their profession. The majority (19 of 26, 73.1%) had worked more than 5 years post internship.

3.1.2 Study sample in study II

This study involved 30 male violent offenders sentenced to forensic psychiatric care and undergoing in-patient treatment at four forensic psychiatric hospitals within 200km of

Stockholm. Their diagnoses had been made by their attending physicians according to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, DSM-IV (American Psychiatric Association, 2000) and The ICD-10 International Classification of Mental and Behavioural Disorders (World Health Organisation, 1992). Background data on their age, educational level, diagnosis, medication and substance abuse history was obtained from the forensic psychiatric case records. The patients were divided into two diagnostic groups; 15 patients with psychotic illness in one group (e.g. schizophrenia, psychosis not otherwise specified) and 15 patients with ASD in the other (e.g. Asperger's syndrome), two diagnostic groups common within Swedish forensic psychiatry. The patients with psychosis were free from overt psychotic symptoms at the time of the study. Controls were 7 healthy men recruited from the local community. They did not have any self-reported previous criminal convictions, mental problems in the last 5 years, current medication or substance abuse problems.

All participants were between the ages of 20 and 52 (median ages between 30 and 34) and there was no age difference between the groups. The controls had a similar educational level to that of the patients (completed compulsory school or senior high school). Nearly all MDOs were prescribed antipsychotic medication. A greater number of the MDOs with psychosis had substance misuse problems than did those with ASD.

3.1.3 Study sample in study III

Fourteen men, on probation for an IPV offence and in the final phase of treatment with the IDAP programme at a probation office at in central Stockholm, were offered use of the RoD/IPV simulation system by the probation officer in the research group (IDAP group). This group was compared with 10 men serving a sentence (of up to one year) for IPV at a prison 250km from Stockholm, who had never taken part in the IDAP programme and had not participated in any other intervention programme within the prison service in the past year (non-IDAP group). The men in the non-IDAP group were recruited by a prison officer asking for volunteers at a routine general meeting with the inmates. These two offender groups were compared with each other and with a control group comprising 10 healthy men without a criminal record who were selected to approximate the offenders' ages and level of education and were recruited from volunteers at a large steel factory (control group). The following inclusion criteria were common to all groups: male gender, age between 20 and 55, Swedish-speaking, and raised in Sweden. The following exclusion criteria were common to all groups: serious mental health issues and medication (other than disulfiram, acamprosate, or naltrexone, used to treat substance abuse).

Upon statistical analysis of the differences in background characteristics between subjects in the three groups, significant differences were found with regard to the following: level of education; level of intelligence as measured by the non-verbal intelligence test Ravens Standard Progressive Matrices (Raven's SPM; Raven, Raven, & Court, 1998); level of computer literacy; alcohol use and drug use, but not age (median ages between 30 and 40). Fewer participants in the non-IDAP group had finished high school ($p = 0.001$) and were computer literate ($p < 0.001$). Compared with both the IDAP and control groups, a greater number of participants in the non-IDAP group had harmful alcohol use ($p = 0.02$) according to the Alcohol Used Disorders Test, AUDIT, (Babor, Higgins-Biddle, Saunders, & Monteiro,

2001) and narcotic use ($p = 0.003$), according to the Drug Use Disorders Identification Test, DUDIT, (Berman, Bergman, Palmstierna, & Schlyter, 2004). Those in the control group had a higher level of intelligence than those in the offender groups ($p = 0.004$). Thus the IDAP group and the control group were the most similar of the three groups with regard to background characteristics, with the exception of level of intelligence and, as expected, previous history of violence.

3.1.4 Study sample in study IV

Twenty men between 20 and 59 years of age (median age 27) were recruited to participate in the study, primarily through flyers posted in public places around Stockholm. They did not have any self-reported serious mental or physical disorders (including substance dependence) requiring on-going in or outpatient care, or medication. They were not employed within the criminal justice system and did not have a self-reported criminal record or history of IPV. All but one participant had completed high school and 30% ($n = 6$) had a university degree. All but three participants had a percentile rank score within the average range according to Raven's SPM. The three participants outside the average intelligence range had rank scores in the range well above average. AUDIT scores did not show harmful alcohol use among the participants, but DUDIT scores revealed cannabis use in three participants and possible cannabis abuse in one participant.

Table 1. Overview of study participants

Number and distribution of study participants	Forensic psychiatric assessors		Violent offenders		Healthy, non-offender controls
			Forensic psychiatric patients	Prisoners/probationers	
Study I n = 26	n = 26	-	-	-	-
Study II n = 37	-	n = 30	-	-	n = 7
Study III n = 34	-	-	n = 24	-	n = 10
Study IV n = 20	-	-	-	-	n = 20
Total n = 117	n = 26	n = 30	n = 24	n = 24	n = 37

3.2 PROCEDURES AND MEASURES

The four studies were performed using three different methods, paper case vignettes (study I), interactive computer simulation (studies II and III), and psychophysiological measurements during observation of segments taken from the computer simulation (study IV). All four were experimental studies. Study I was a single-blinded total population study of persons who

perform forensic psychiatric assessments in Sweden. As they pioneered the use of this simulation technology within their contexts, the computer simulation studies were designed as relatively small pilot studies, two of them comprising offender and control groups (study II and III) and the third using only a control group (study IV).

3.2.1 Study I

The research group was made up of three forensic psychiatrists, two general psychiatric trainee doctors, a forensic social worker and an experimental psychologist, all with affiliation to the Department of Clinical Neuroscience at Karolinska Institutet. Four members of the group were female and three were male. The group created six case vignettes describing an offender's background, an index offence, and the findings at forensic psychiatric assessment, but omitting the final conclusions (the opinion). The cases were constructed, in accordance with the DSM-IV, to illustrate the following diagnoses, common in forensic psychiatry: schizophrenia (case 1), borderline personality disorder (case 2), substance induced psychotic disorder (case 3), Asperger's syndrome (case 4), antisocial personality disorder (case 5), and mental retardation (case 6). In all cases, the offender had committed an offence that is likely to have been tried as gross assault according to the Swedish penal code. The cases were made as similar to each other as possible with regards to length, language, level of detail, and terminology used. A copy, in which the offender's gender had been changed, was created for each case. The female copy was labelled A, and the male copy was labelled B. In three cases (2,4, and 5) the victim's gender also differed between the A and B case, and in case 4 a witness' gender was also changed. This was in an effort to make the motives and gender patterns more common so as not to arouse suspicion among the participants that gender was the main focus of the study.

Three months before the day of the study, a small pilot study was performed by sending two identical sets of instructions, cases, and answer sheets to a forensic psychiatrist and forensic psychologist who were not currently employed by the National Board of Forensic Medicine. They were asked to assess if the instructions were clear enough, if the questionnaire was comprehensible and user-friendly, and if the entire task (reading the six cases and answering the questions within a two hour time span) was feasible. Their answers and comments were taken into consideration when making the final preparations for the main study.

On the day of the study, the participants were randomly given an envelope containing instructions and six different case vignettes, each with a corresponding questionnaire. Each envelope contained all six cases, but in randomised order and with the offender's gender randomised to female (A) or male (B). The randomisation was stratified in such a way that each participant read three cases in which the offender was male and three in which the offender was female. For instance one participant's envelope could have contained the following gender-combination of cases in the following order: 1A, 2B, 3A, 4B, 5A, 6B and another could have contained 3B, 5B, 1B, 4A, 2A, 6A.

To minimize the possibility of the participants discussing the cases with each other, the study took place at the same hour on the same day at the departments in Stockholm and Gothenburg. It commenced with a brief meeting at each location during which the participants received verbal instructions by the study supervisors. They were asked

specifically to collect their randomly allocated sealed envelope containing the study material, go straight to their offices, not communicate to with each other throughout the duration of the study, and to return the material to the study supervisor, in a sealed envelope, upon completion. Coffee and cake was served as remuneration for participation in the study.

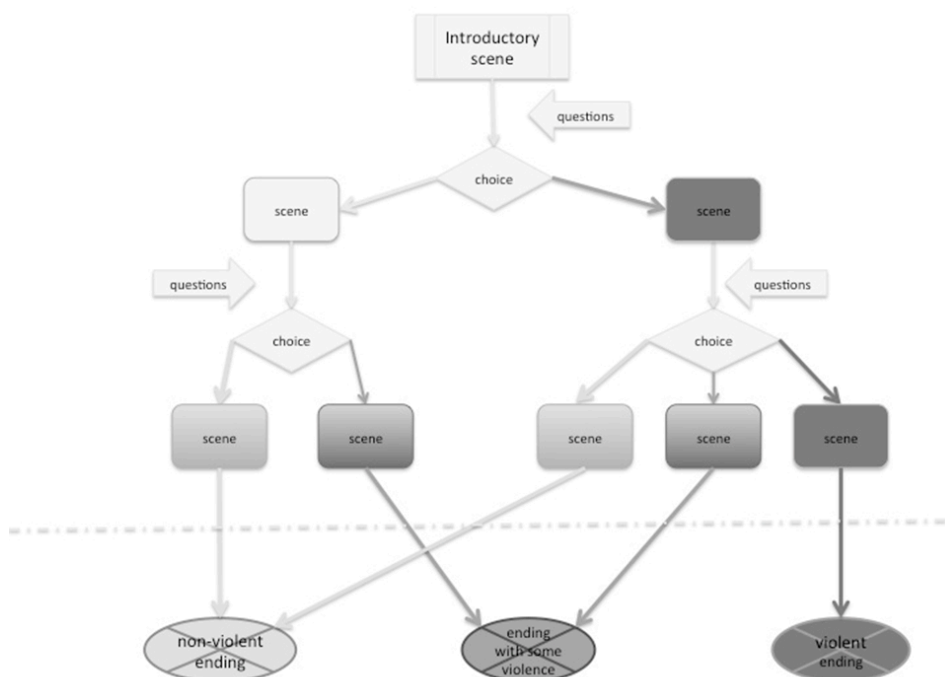
The primary outcomes analysed were if the offender was assessed as having an SMD at the time of the offence (precluding him/her from a prison sentence), if he/she was found in need of compulsory forensic psychiatric care at the time of the assessment (permitting a sentence to forensic psychiatric care), and if there was risk of serious repeat offending (mandating administrative court review as part of the forensic psychiatric care sentence).

3.2.2 Study II

The scenario in RoD/FP involves a young man named Anders in a mild, everyday conflict-situation with his mother, with whom he still shares an apartment. At the end of an introductory film sequence, the scenario stops and the user is asked questions regarding his interpretation of the simulated characters' physical and emotional reactions and what the male character is thinking.

The physical reactions, which the participant can tick on behalf of the characters, are based on Cannons "fight or flight response" (Cannon, 1932; Taylor et al., 2000) and the emotional reactions are based on Ekman's "basic emotions" (Ekman, Sorenson, & Friesen, 1969). The user's interpretation of the main character's thoughts is given in free text. After answering the three questions, the user is asked to choose what the main character would do next by clicking on one of eight possible actions, four non-violent and four violent actions. The action is then shown, together with its consequences, as a film clip. Each action is then followed by one or more decision points, depending on which actions have been chosen on behalf of the simulated character. The user is asked the same questions as above after each film clip. The reactions ticked, free text entered, choices made, and latency times are all automatically logged by the computer system.

Figure 1. Simplified flowchart of the RoD/FP and Rod/IPV systems



This study of the RoD/FP was divided into two different experiments that were carried out at a forensic psychiatric hospital (MDOs) or at the Department of Computer and Systems Sciences at Stockholm University (controls). In experiment 1 the MDOs were asked to choose freely between the eight different actions at the first decision point after the introductory film clip. As all of the MDOs chose one of the non-violent alternatives, the controls were asked to choose one of the non-violent alternatives in experiment 1. In order to investigate how the subjects would answer in both a nonviolent as well as in a violent situation, both patients and controls were asked to choose one of the four violent alternatives in experiment 2. For practical reasons, the MDOs performed experiment 1 and 2 on separate days, while the controls carried out both experiments on the same day. One MDO refused to take part in experiment 2. Two MDOs were excluded from this experiment as they did not choose a violent action and another was not available when experiment 2 was scheduled. Nine other MDOs could not perform the second experiment due to other reasons, including time constraints on the forensic psychiatric ward.

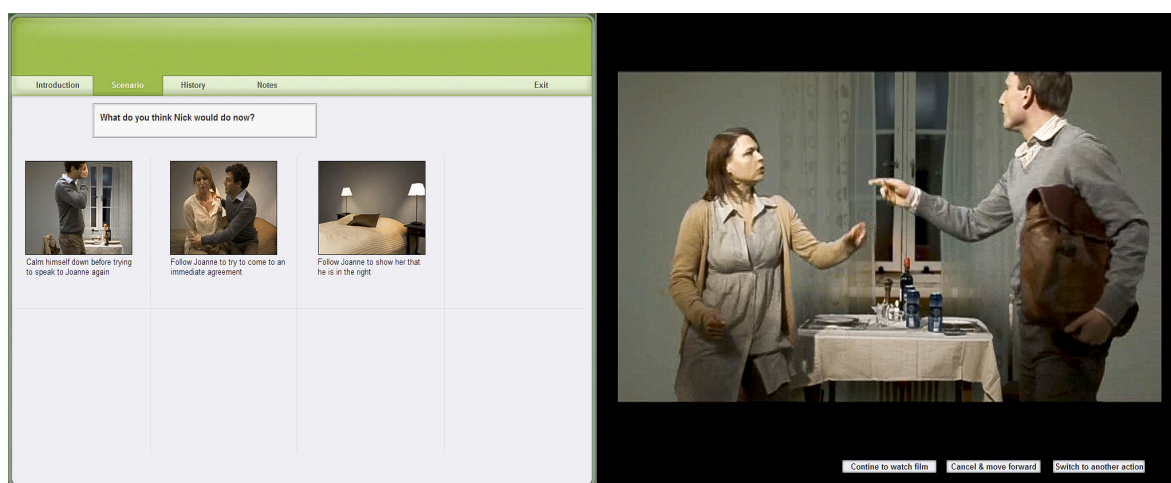
The primary outcomes analysed in the study were the following computer interactions performed by the participants: violent choices made, physical and emotional reactions ticked, free text entered, and latency times.

3.2.3 Study III

A multidisciplinary team comprising two forensic psychiatrists, a probation officer, and a medical simulations expert, all with extensive experience in their respective fields, created the RoD/IPV scenario for the RoD computer system with the help of the professional film production company Länna Studios. The RoD system allows the user to choose from a set of actions on behalf of the simulated main character and visualizes all events and reactions between the characters as realistic, digitized film clips showing real human actors. All scenes

were filmed using professional actors, edited, digitized and, together with interactive questions and a neutral clean interface, inserted into the authoring tool Adobe Macromedia Authorware 7.0 Professional. The system was run on a portable computer with a large high-resolution screen and high-quality speakers.

Figure 2. Screen shots of the RoD/IPV interface from the English (left) and Swedish versions (right) of the program



This RoD/IPV scenario was designed to reflect a conflict situation that the experts deemed typical of IPV cases seen among contemporary Swedish IPV offenders. The plot line involves the simulated male character (Niklas) showing jealous and controlling behaviour towards his female partner (Annika), who has been away from home on a work-related overnight stay and comes home later than expected. The conflict can escalate from a verbal dispute to physical violence or can de-escalate and be resolved in a non-violent way, depending on which actions the participant chooses on behalf of Niklas. When the participant reaches one of the five points in the program at which a choice must be made, questions regarding the simulated couple's probable physical reactions, feelings, and thoughts are posed. As in the RoD/RP system, the physical reactions, which the participant can tick on behalf of the characters, are based on Cannon's "fight or flight response" and the emotional reactions are based on Ekman's "basic emotions". In the RoD/IPV, there are four end points that range from a non-violent resolution of the conflict, in which the couple goes on to have a nice dinner and plan the rest of their weekend together, to a violent ending, in which the male character threatens his partner with a kitchen knife but is interrupted by the police ringing the doorbell and the couple's toddler standing the doorway.

In this study, each participant took part in an individual two-hour session that involved using the computer simulation, answering the user questionnaire, and additional assessment of background characteristics, under the supervision of a forensic psychiatrist and a probation officer from the research team. The study sessions were performed at the probation office, prison, and the steel plant from which the control group was recruited. The first time a participant performed a trial of the computer simulation, he was free to choose all the main character's reactions, up to one of the four endpoints, without any form of influence from the researchers. For sake of ease of analysis, the endpoints are ranked as "non-violent, some

violence, most violent ”, according to the level of conflict between the characters in the final scenes, but they are not labelled as such in the program. During the subsequent simulation trial (immediately following the first one), the participant was guided through the scenario up to the “most violent” ending by the researcher, if he had not already chosen this in the free choice trial. The researcher concluded the test session by guiding the participant through to the “non-violent” ending, if the participant had not already chosen this ending in the free choice trial. Thus all participants viewed both the “non-violent” and “most violent” endings during their test session. In each trial, the participant answered questions regarding Niklas’, (and, in certain places, his partner Annika’s) thoughts, feelings, and physical reactions. All 34 participants completed the computer simulation and the computer system automatically logged information on the choices made in the program, the multiple-choice alternatives (regarding emotional and physical reactions) marked, and the answers written in response to the free text questions.

Upon completion of the computer simulation, the participants were asked to rate their experience of RoD/IPV in a user-questionnaire, using a four-item Likert-type scale. The questionnaire consisted of thirteen questions regarding user-friendliness, comprehensibility, and possible future uses of the system. An additional four questions were posed to the IDAP group regarding the relevance of the RoD/IPV to IDAP. In each of the non-IDAP and control groups, one person omitted filling out the user questionnaire, hence the results analysed are based on fourteen participants in the IDAP group and nine participants in the non-IDAP and control groups.

During the same study session, a supervising researcher (a forensic psychiatrist) performed/administered the following additional assessments of the participants’ background characteristics, the results of which are summarized in the participants section above (see 3.1.3): a Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version, SCID-I (First, Spitzer, Gibbon, & Williams, 1996) to exclude serious mental illness; a violence risk assessment using the B-SAFER; the AUDIT and DUDIT questionnaires to gauge substance use; Raven’s SPM to measure level of intelligence. If a probation officer had previously carried out any of these assessments in conjunction with the probation sentence, the results were obtained from the probation records. An experienced clinical psychologist aided in the Raven’s SPM scoring. One participant in the non-IDAP group and one in the control group did not complete the Raven’s SPM, reporting that it was “too boring”. Four answer sheets were excluded due to inconsistencies. In total, 27 Raven’s SPM scores were analysed (11, 7, 9 in the IDAP, non-IDAP, and control groups respectively).

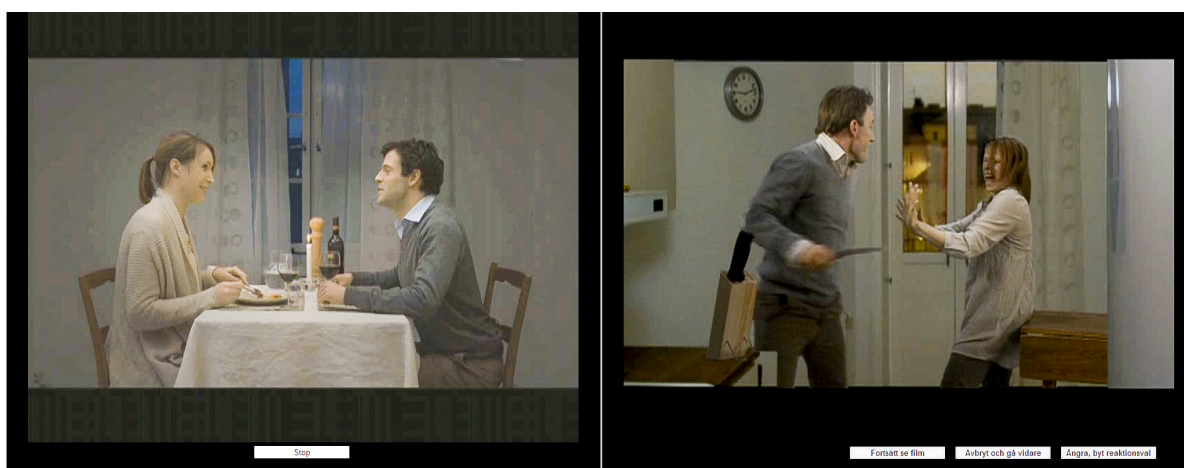
The primary outcomes analysed in the study were the results of the user questionnaires as well as the following computer interactions performed by the participants: type of end chosen in the “free choice trial”, physical and emotional reactions ticked, and free text entries made.

3.2.4 Study IV

A forensic psychiatrist and member of the research group performed the study at The Department of Computer and Systems Sciences, Stockholm University. Each study participant was shown the same two sequences of film clips, taken from the RoD/IPV program, on a computer screen. One sequence depicted a neutral interaction between a male

and female in an intimate partner relationship. The other sequence showed the couple engaging in a conflict, which began as a verbal dispute and culminated in the man threatening his female partner with a knife. Both sequences were made up of four film clips, each lasting 30 seconds, which were separated by a blank screen. The computer randomized the order in which the participants were shown the violent and non-violent sequences, but, within each sequence, the order of the film clips was kept the same, as they show a logical progression of events, which would be disturbed should their internal order be altered. Between each film clip, the participant recorded responses to the Self Assessment Manikin (SAM) scale using the computer keyboard. The SAM scale is a quick, easy, non-verbal, picture-based method that directly measures feelings of pleasure, arousal, and dominance related to an affective response in several different contexts (M. M. Bradley & Lang, 1994).

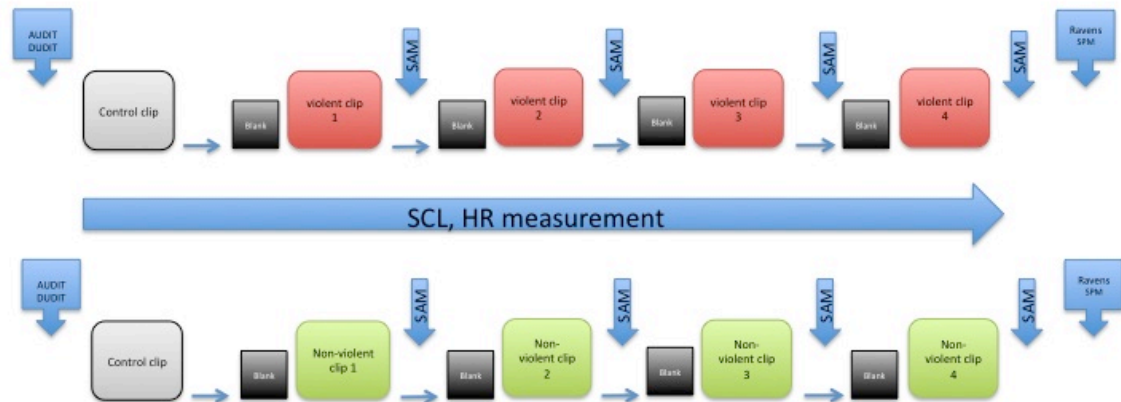
Figure 3. Screenshots from the RoD/IPV program depicting a non-violent scene (English version) and violent scene (Swedish version) respectively



The participants' GSR and HR were recorded throughout the experiment using BIOPAC MP150 data acquisition system and AcqKnowledge software (BIOPAC Systems, Inc.) with a sampling rate of 2000Hz. GSR electrodes were placed on the thenar and hypothenar eminence of the non-dominant hand and the pulse plethysmograph on the first finger of the same hand. Baseline values were recorded during a 1 minute long film clip of a ship gliding through a sunset which was shown prior to those taken from the RoD/IPV program.

During the experiment session, the participants also filled out the substance abuse questionnaires AUDIT and DUDIT and the intelligence test Raven's SPM. The forensic psychiatrist also performed a SCID-I screening interview to exclude serious mental illness.

Figure 4. Flowchart of the research protocol



The primary outcomes analysed were changes in the SCL component of the GSR, HR, and self-reported arousal and valence on the SAM scale recorded between viewing of the violent and non-violent film clips from the RoD/IPV. The specific hypotheses tested were 1) that there were no differences between the mean HR, SCL, and subjective ratings of arousal and valence recorded while watching the control, non-violent, and violent film clips and 2) that there were no differences in the change in variance of HR and SCL between the non-violent and violent groups. This was measured as the difference between a participant's mean HR and SCL recorded during the control film and his maximal HR and SCL recorded during the non-violent and violent scenes respectively. The choice of statistical parameters was based upon recently published studies involving HR and SCL reactions to film clips (Choi et al., 2011; Fernandez et al., 2012) and the description by Dawson et al. (2007) of the electrodermal system.

3.3 STATISTICAL ANALYSES

SPSS (versions 19- 22) were used for all statistical analyses, with the exception of study II in which GraphPad Prism (version 6) was used instead. As the sample sizes throughout were relatively small and results not assumed to be normally distributed, non-parametric methods of analysis were preferred. In the studies made up of three groups (studies II and III), tests were first performed on the three groups together, followed by pairwise *post hoc tests* of results found to be statistically significant. All analyses were performed for observed cases. As only a limited number of planned comparisons were made between groups in each study

and all tests of significance performed have been described and explained, it was not deemed necessary to perform mathematical corrections for multiple comparisons (Perneger, 1998).

3.3.1 Study I

Due to the fact that the same 26 participants assessed all six cases, all assessments were not independent of each other, thus preventing aggregate forms of analysis. All cases were analysed separately, mainly using Fisher's exact test. A *post hoc* analysis, using Fisher's exact test, was performed to test the relationship of assessor characteristics to any case in which a significant result regarding gender differences in the main parameters was observed (in practice this was only applied to risk of violent recidivism in the mental retardation case, case 6). The results are presented as the relative risk (RR) of an outcome for a female as compared with a male offender (risk for a female divided by risk for a male). Two-sided *p* values of less than 0.05 were taken to be significant.

3.3.2 Study II

For comparison of data regarding the choices of action and physical and emotional reactions made by the participants on behalf of the simulated characters, Fisher's exact test was used in comparisons between all three groups and in pairwise *post hoc* tests. Two-sided *p* values of less than 0.05 were considered statistically significant. As all data was recorded by the computer during the simulation sessions, there was no missing data once a simulation session had commenced, however, several MDOs did not take part in experiment 2 (see section 3.2.2) and were thus excluded from the statistical analysis of this experiment.

3.3.3 Study III

Continuous variables were analysed across the three study groups using Kruskal-Wallis test, followed by, if a statistically significant difference was found, pairwise *post hoc* comparisons, using Mann-Whitney U test. Categorical variables were analysed across the three groups using chi-squared test, and pairwise *post hoc* tests of significant results were performed using the same method. *Post hoc* pairwise comparisons were made only if the test across all three groups showed differences significant at the 0.05 level. All statistical tests were two sided and $p < 0.05$ (5% significance level) was interpreted as statistically significant. There was no missing data for the results automatically logged by the computer (the participants' choices of reactions in the system and the participants' interpretations of the physical and emotional reactions displayed in the simulation). Regarding the participants' experiences of the simulation system, as recorded by use of a paper questionnaire, the primary analysis was performed for observed cases. Questionnaire items answered with "don't know" were analysed as missing data. Items in which the missing data was greater than ten per cent were excluded.

3.3.4 Study IV

As data was not found to be normally distributed, the non-parametric Kruskal-Wallis test (differences between arousal, valence, HR, and SCL means) and Mann-Whitney U test (differences between changes in HR and SCL) were used. All statistical tests were two sided and *p* values less than 0.05 were interpreted as statistically significant. As all data was logged

onto the computer there was no missing data. However, it was noted that two of the participants showed SCL levels close to zero throughout the course of the experiment, apparently caused by suboptimal skin contact due to the gel having dried out on one particular batch of pre-prepared SCL electrodes.

3.4 ETHICAL CONSIDERATIONS

An important general ethical consideration when working with offenders sentenced to forensic psychiatric care or prison/probation is that they are under obligation to be in contact with these institutions. Thus they may feel obliged to participate in any research sanctioned by the hospital or prison/probations office, out of fear that refusing to do would negatively affect their chances for discharge/conditional release. It was therefore deemed of paramount importance to inform the offenders that participation in the studies (studies II and III) was entirely voluntary, to obtain both verbal and written consent, and to explain that participation or non-participation in the research would not have any effect whatsoever on their sentence. In the studies in which non-offenders were recruited from their workplace (studies I and III) they were assured that their acceptance or refusal to participate would have no bearing upon their professional careers. All participants were told that they were free to cancel and leave an on-going experiment at any time. They were also informed that their background data and the results of the studies would be analysed on a group level and that individuals would only be identifiable through a code, the key to which would be kept in a locked archive belonging to Karolinska Institutet.

In study I the participants were invited to partake of coffee and cake in the staff room upon completion of the study. In studies III and IV, each participant was given two cinema tickets as remuneration.

A complete application for ethical permission for study I was presented to the Swedish Ethical Review Board, which came to the decision that ethical permission was not needed for this study, on account of it not involving real patients or clients (Dnr 2010/255-31/5). The Swedish Ethical Review Board granted ethical permission for study II (Dnr 2006/208-31), III (Dnr 2009/1652-31/5), and IV (Dnr 2013/2016-31/2).

4. RESULTS AND COMMENTS

4.1 STUDY I

There were no statistically significant differences, on the basis of gender, in the proportion of cases in which the offender was assessed as having an SMD at the time of the offence, but certain trends did appear (Table 2). In the schizophrenia case (case 1), all participants assessed the offender as having an SMD. In the antisocial personality disorder case (case 5), all participants assessed the offender as not having an SMD. The largest gender differences were found in the borderline personality disorder case (case 2), in which 33.3% of those who assessed the case as a female assessed the offender as having an SMD compared with 9.1% of those who assessed the case as male (RR=3.67; $p = 0.20$).

Table 2. Offenders, in the case vignettes, assessed as having serious mental disorder (SMD) at time of offence, presented as risk ratios, confidence intervals (CI), p values (using Fisher's exact test).

SMD present at time of offence	Case 1 Schizophrenia n=26 (14 as female)	Case 2 Borderline personality disorder n=26 (15 as female)	Case 3 Psychosis/ substance abuse n=26 (11 as female)	Case 4 Asperger's syndrome n=26 (15 as female)	Case 5 Antisocial personality disorder n=26 (13 as female)	Case 6 Mental retardation n=24 (13 as female)
Total number of offenders % (n)	100.0 (26)	23.1 (6)	65.4 (17)	46.2 (12)	0	12.5 (3)
Female offender % (n)	100.0 (14)	33.3 (5)	63.6 (7)	46.7 (7)	0	15.4 (2)
Male offender % (n)	100.0 (12)	9.1 (1)	66.7 (10)	45.5 (5)	0	9.1 (1)
Relative risk of SMD if female offender	1	3.67 (95% CI = 0.50, 27.11; $p = 0.20$)	0.95 (95% CI = 0.54, 1.68; $p = 1.00$)	1.03 (95% CI = 0.44, 2.39; $p = 1.00$)	0	1.69 (95% CI = 0.18, 15.96; $p = 1.00$)

The participants' assessment of whether or not the offender was suffering from an SMD at the time of the assessment and in need of forensic psychiatric care was found to be identical to that of the assessment of SMD at the time of the offence, in all cases except in the borderline personality case (case 2). In this case, two additional participants (one of whom had assessed the case as female and one as male) determined that the offender had an SMD at the time of the assessment and was in need of care (RR=2.30; $p = 0.40$).

With regard to gender bias regarding an offenders' risk of serious criminal recidivism (Table 3), a significant gender difference was found in the mental retardation case (case 6). The relative risk of the mentally retarded offender portrayed as a female being assessed as having a risk of serious criminal recidivism was 3.50 ($p = 0.04$), as compared with the same offender portrayed as a male. *Post hoc* analysis did not reveal the assessors' own gender ($p = 1.00$), place of work ($p = 0.38$), experience (all had greater than 5 years experience), or specific profession ($p = 0.50$) as significantly associated with the likelihood of the offender portrayed as female as having a serious recidivism risk. A similar, although not significant ($p = 0.10$), relationship was found in the antisocial personality disorder case and in the psychosis/substance abuse case. In the other cases, the relative risk of a female offender being assessed as having a risk of serious criminal recidivism was nearly equal to one.

Table 3. *Offenders, in the case vignettes, assessed as having risk of serious violent recidivism, presented as risk ratios, confidence intervals (CI) and p values (using Fisher's exact test).*

Recidivism risk present	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
	Schizophrenia n=26 (14 as female)	Borderline personality disorder n=20 (13 as female)	Psychosis/substance abuse n=24 (9 as female)	Asperger's syndrome n=21 (13 as female)	Antisocial personality disorder n=17 (10 as female)	Mental retardation n=16 (8 as female)
Total number of offenders % (n)	100.0 (26)	90.0 (18)	87.5 (21)	85.7 (18)	70.6 (12)	56.3 (9)
Female offender % (n)	100.0 (14)	92.3 (12)	100.0 (9)	84.6 (11)	90.0 (10)	87.5 (7)
Male offender % (n)	100.0 (12)	85.7 (6)	80.0 (12)	87.5 (7)	42.9 (3)	25.0 (2)
Relative risk if female offender	1	1.08 (95% CI = 0.77, 1.52; $p = 1.00$)	1.25 (95% CI = 0.97, 1.61; $p = 0.27$)	0.97 (95% CI = 0.69, 1.37; $p = 1.00$)	2.10 (95% CI = 0.89, 4.94; $p = 0.10$)	3.5 (95% CI = 1.02, 11.95; $p = 0.041$)*

* $p < 0.05$ (two-tailed)

4.1.1 Comments

With regard to the main outcome, there were no statistically significant differences, on the basis of gender, in the proportion of cases in which the offender was assessed as having an SMD at the time of the offence and in need of forensic psychiatric care. This was particularly apparent in the cases involving an offender with schizophrenia (case 1) and antisocial personality disorder (case 5), in which all participants made the same assessment of the offender. These findings contradict earlier international and Swedish findings, which have indicated that female offenders are more likely than males to be assessed as having an SMD

and more likely than males to be sentenced to forensic psychiatric care due to gender bias (Grann et al., 1999; Holmberg et al., 2006; Menzies et al., 1992; Sturup et al., 2007; Yourstone et al., 2008 Yourstone et al., 2009). However, a significant gender difference was found with regard to the assessment of the offender's risk of serious criminal recidivism. The offender with mental retardation (case 6) portrayed as a female was almost four times as likely to be assessed as having a risk of serious criminal recidivism as the same offender portrayed as a male. A similar, though not statistically significant, difference was found in the antisocial personality disorder case (case 5), in which the offender portrayed as female was twice as likely to be found to have a risk of serious criminal recidivism as her male counterpart. Literature on violence risk assessment of females, in general and forensic psychiatry, indicates that mental health professionals underestimate females' actual risk of violence (Elbogen et al., 2001; Skeem et al., 2005), which could be attributed to gender based biases (de Vogel & de Ruiter, 2005). It was therefore assumed that, if any gender bias was to surface in this case vignette study, it would reveal that the female offenders portrayed would be assessed as less, rather than more, likely to be violent than their male counterparts. The *post hoc* test suggesting that the assessors' own gender was not related to the outcome of their assessment of the female offender, is, however, deemed to be in line with findings in the Skeem et al. (2005) study, which showed no interaction between the gender of the assessor and assessee in violence risk assessment.

4.2 STUDY II

In experiment 1, the physical and emotional reactions chosen directly after the introductory film sequence, on behalf of the simulated male character Anders, were analysed. Significantly fewer offenders ticked that Anders was angry compared with controls ($p = 0.003$) and most MDOs ticked that Anders felt nothing, whereas only one of the controls chose this answer ($p = 0.042$)(Table 4).

When asked to choose one of the violent actions in experiment 2, there was a statistically significant overall difference in the distribution of choices between the MDOs and controls ($p = 0.002$) (Table 5). Pairwise post hoc analysis showed that significantly more MDOs than controls, irrespective of diagnosis, chose the most violent action ('he would take an axe and break the door'). The answers to the questions following the violent film clips showed a tendency for the controls to choose more physical reactions per participant than the offender patients, but this difference did not reach statistical significance. There were also no significant differences between the groups in terms of the number of emotional reactions selected on behalf of the simulated characters. Some of the emotions and physical reactions answers ticked by individual MDOs were incongruous with the simulated situation e.g. that Anders would be feeling happy when he hit his mother with an axe, and that she would feel "nothing special" and be 'surprised'.

Table 4. Summary of participants' answers regarding the main character's physical and emotional reactions when facing an adverse situation in the RoD/FP (following the introductory film clip, experiment 1).

	All MDOs (n=30)	Controls (n=7)	<i>P (using Fisher's exact test)</i>
Physical reaction			
His heart is beating hard and fast	6 (20%)	4 (57%)	0.069
His muscles are tense			
Difficulty breathing	2 (6.7%)		
Trembling	2 (6.7%)	1 (14%)	
Sweating	1 (3.3%)		
Cold			
Relaxed			
Stomach ache	6 (20%)	1 (14%)	
Visual sensations			
Nothing special	16 (53%)	1 (14%)	0.098
Emotional reaction			
Anger	5 (17%)	6 (86%)	0.001*
Fear	2 (6.7%)		
Happiness			
Sadness	1 (3.3%)	1 (14%)	
Surprise	3 (10%)		
Disgust	1 (3.3%)		
Irritation		2 (29%)	
Revulsion			
Nothing	18 (60%)	1 (14%)	0.042*

* $p < 0.05$ (two-tailed)

Table 5. Violent choices made on behalf of Anders in experiment 2

Alternative	He would take an axe and break the door	He would hit the door	He would break something that belongs to his mother	<i>p (using Fishers exact test)</i>
All MDOs (n=17)	15 (88%)	1 (6%)	1 (6%)	0.002*
Controls (n=7)	1 (14%)	4 (57%)	2 (29%)	

* $p < 0.05$ (two-tailed)

4.2.1 Comments

We have investigated how MDOs, diagnosed with either ASD or psychosis but generally medicated and overtly symptom free, used the RoD/FP system and compared their choices and answers to those of healthy controls. It is interesting that most of the controls perceived the situation in which the bathroom was occupied as challenging for the simulated character Anders, and that they were more likely to answer that Anders was angry, although Anders'

face did not reveal any emotion, whereas most MDOs attributed no emotions to Anders in this circumstance. A possible explanation could be that the controls infer Anders' state of mind from the introductory information that states that Anders is a rather inflexible person which has led to a conflict at work and that he is on medication prescribed by a psychiatrist, while the MDOs are less sensitive to such cues. Most of MDOs noted in the free text that an occupied bathroom is an everyday occurrence but made no reference to Anders' personality traits. It is possible that this finding illustrates a difficulty in estimating the cognitions, perceptions, and emotions of others, often referred to as deficient theory of mind, which has been observed in mental illnesses such as ASD schizophrenia (Murphy, 2006) but also in groups of violent offenders without mental illness such as IPV offenders (Marshall & Holtzworth-Munroe, 2010). The RoD/FP may help to detect such deficits by observing users' responses to emotional cues (de Vignemont & Singer, 2006; Kristiansson & Sorman, 2008).

When asked to choose a violent alternative on behalf of the simulated character, most MDOs, but only one of the controls, chose the most violent alternative for Anders. The reason for this is unclear. It may be due to the MDOs not interpreting the other, subtler, violent alternatives as being truly violent or that they thought that the researcher was asking them to choose the most violent alternative and simply wanted to comply. This is worth exploring further.

Following the film clips depicting violent actions; the controls reported twice to 50 % as many physical reactions on behalf of the simulated main character as the MDOs. Research has shown that offenders with psychotic and neuropsychiatric disorders show less autonomic activation in response to both neutral and negative pictures compared to healthy non-criminal controls (Wahlund, Sorman, Gavazzeni, Fischer, & Kristiansson, 2010). It is possible that the paucity of physical reaction selected by the MDOs on behalf of the simulated character is a reflection of this trait in the MDOs themselves. It is also possible that the MDOs themselves experience such sensations but, due to lack of skills in interpreting them in others or lack of skills in expressing themselves, did not tick them on behalf of the simulated male character.

Some MDOs had given answers that were incongruent with their choices or were deviant. For example an MDO had ticked that the simulated character felt happy when hitting his mother with an axe. Whether this offender really does derive pleasure from violence or wanted to portray himself as extreme, cannot be distinguished in RoD/RP, but either of these alternatives provides a valuable starting point for evaluating further attitudes to, and risk of, future violence.

4.3 STUDY III

The moment at which Niklas first uses physical violence towards Annika had been selected, pre-analysis, as a key point at which to explore the participants' perceptions of the simulated characters' thoughts, emotions, and physical reactions. The majority of participants indicated that the male character would be angry and the female character fearful. No incongruous emotions were marked, such as that the characters would be feeling happy or calm, and no one ticked that they would be feeling "nothing special". As seen in Table 6, significant differences emerged between the groups with regard to their interpretation of the following: the male character's fear; female character's anger, sadness, contempt/disgust; total number of emotions ticked on behalf of the male character.

Table 6. Subjects' interpretations of emotional reactions displayed by the simulated characters in RoD/IPV across all groups

Emotional reactions displayed by the simulated characters	Male character (Niklas)				Female character (Annika)			
	IDAP group n (%)	Non-IDAP group n (%)	Control group n (%)	χ^2 (p)	IDAP group n (%)	Non-IDAP group n (%)	Control group n (%)	χ^2 (p)
Anger	13 (93%)	10 (100%)	9 (90%)	0.97 (0.62)	1 (7%)	6 (60%)	5 (50%)	8.48 (0.014*)
Fear	9 (64%)	4 (40%)	0	10.23 (0.006**)	14 (100%)	9 (90%)	9 (90%)	1.49 (0.48)
Happiness	0	0	0	-	0	0	0	-
Sadness	5 (36%)	1 (10%)	1 (10%)	3.33 (0.19)	12 (86%)	5 (50%)	2 (20%)	10.42 (0.005**)
Surprise	0	0	0	-	4 (29%)	2 (20%)	0	3.33 (0.19)
Calm	0	0	0	-	0	0	0	-
Contempt/disgust	11 (79%)	5 (50%)	6 (60%)	2.22 (0.33)	9 (64%)	0	8 (80%)	14.74 (0.001**)
Nothing special	0	0	0	-	1 (10%)	1 (7%)	0	0.97 (0.62)
Total number of Emotions (median per subject, range)	38 (3, 4)	20 (2, 2)	16 (2, 1)	9.43 (0.009**) ^a	40 (3, 3)	22 (2, 4)	24 (2.5, 2)	3.11 (0.21) ^a

Note: χ^2 test was used for pairwise testing

^a using Kruskal-Wallis test

* $p < 0.05$ (two-tailed), ** $p < 0.01$ (two-tailed), *** $p < 0.001$ (two-tailed)

The findings upon post hoc testing of the significant differences are shown in Table 7. Participants in both offender groups differed significantly from those in the control group with regard to their interpretation of the male character as feeling fear in this situation, which no one in the control group had ticked. The IDAP group differed from both other groups in that more participants interpreted that the female character felt sadness but not anger in the violent situation. The non-IDAP group differed from the majority of participants in the other two groups in that no participants in the IDAP group interpreted that the female character felt contempt and disgust.

Table 7. Pairwise post hoc tests of subjects' interpretations of emotional reactions displayed by the simulated characters in RoD/IPV

Characteristic	IDAP group versus Non-IDAP group	IDAP group versus Control group	Non-IDAP group versus Control group
	Test statistic (<i>p</i>)	Test statistic (<i>p</i>)	Test statistic (<i>p</i>)
Niklas fear ^b	1.39 (0.24)	10.29 (0.001**)	5.00 (0.03*)
Annika anger ^b	7.89 (0.005**)	5.71 (0.02*)	0.20 (0.65)
Annika sadness ^b	3.60 (0.06)	10.36 (0.001**)	1.98 (0.16)
Annika contempt/disgust	10.26 (0.001**)	0.70 (0.40)	13.33 (< 0.001***)
Total nr emotions Niklas ^a	39.00 (0.07)	115.00 (0.005**)	66.00 (0.25)

Note: Post hoc pairwise tests only performed if test across all groups (table 1a) showed significant differences at the 0.05 level

^a using Mann-Whitney U-test

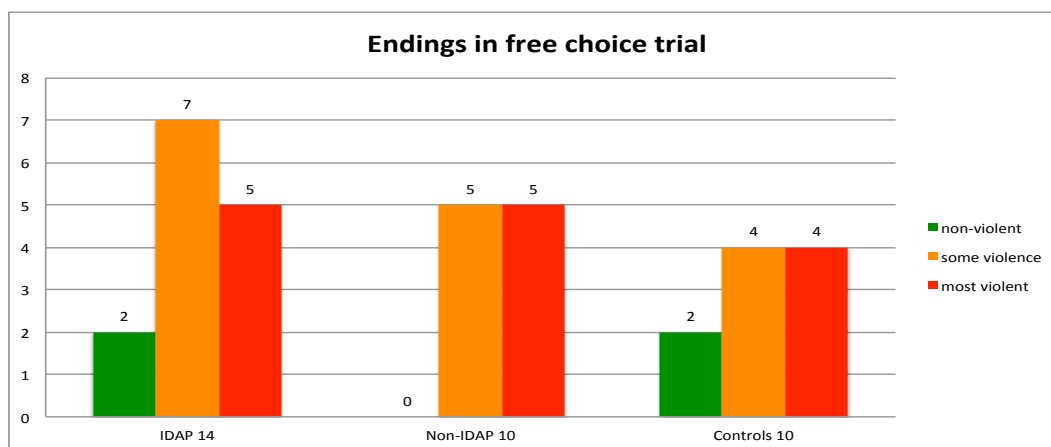
^b using chi-squared test

p* < 0.05 (two-tailed) *p* < 0.01 (two-tailed) ****p* < 0.001 (two-tailed)

The differences in the answers given regarding the physical reactions Niklas and Annika were thought to have at this point were not statistically significant. The most frequently cited physical reactions were increased breathing and heart rate. The only participant who indicated that Niklas would have experienced “nothing special” belonged to the control group. No incongruous or implausible physical reactions, such as sexual arousal, were chosen by any of the participants.

There were no statistically significant differences between the groups with regard to the proportion of participants in each group who chose the non-violent, some violence, or violent endpoint ($\chi^2 = 2.27$; *p* = 0.69). Half of the non-IDAP group (*n* = 5), 40% (*n* = 4) of the control group, and 36% (*n* = 5) of the IDAP group made choices involving increasing amounts of violence culminating in the violent endpoint. The other half of the participants in the non-IDAP group (*n* = 5), half of the IDAP group (*n* = 7), and 40% (*n* = 4) of the control group made choices involving some violence and ending in one of the two middle endpoints, characterised by an unpleasant atmosphere between the simulated characters. It is, however, worth noting that only participants belonging to the IDAP group 14% (*n* = 2) and control groups 20% (*n* = 2) made choices which limited the negative interaction between the characters to a verbal dispute and thus concluded with the non-violent ending (Figure 5).

Figure 5. Choices made in the free choice trial of the RoD/IPV



Overall, there were no differences that reached statistical significance between how participants in the IDAP, non-IDAP, and control groups rated their experiences of using the program on the user questionnaire (Table 8). The only question to which the differences in answers approached significance ($p = 0.09$) was the one in which the participant was asked if he himself felt any physical reaction when performing the simulation. All participants marked that they found the RoD/IPV program realistic and easy to comprehend and that it could be of benefit in treating IPV offenders. Between 56 % (non-IDAP group) and 86% (IDAP group) of participants marked that they found the program emotionally engaging and between 44% (control group) and 61% (IDAP group) ticked that they felt negatively affected when performing the simulation.

Table 8. Subjects' experiences of the RoD/IPV according to the user questionnaire across all groups

Experience	IDAP group n (%)	Non-IDAP group n (%)	Control group n (%)	χ^2 (p)
Easy to comprehend	14 (100)	9 (100)	9 (100)	0.22 (0.90)
Realistic	14 (100)	9 (100)	7 (100)	0.78 (0.68)
Emotionally engaging	12 (86)	5 (56)	6 (75)	4.83 (0.31)
Experienced a physical reaction	6 (43)	5 (56)	2 (22)	11.04 (0.09)
Negatively affected	8 (61)	4 (50)	4 (44)	2.06 (0.92)

Note: No significant differences at the 0.05 level (2-tailed) using chi-squared test.

4.3.1 Comments

The participants' interpretations of the emotional reactions displayed by the simulated characters, following the male character's first use of physical violence towards the female character, indicate that they understood the simulated situation and the emotional cues of the actors. The significant between-group differences observed were with regard to the number of emotions registered and in the more subtle nuances of possible emotions, such as that the

victim could be feeling anger, as well as fear, and the perpetrator could be feeling fear, as well as anger in the IPV situation. Three of the five significant differences were regarding the interpretation of the victim's emotions (anger, sadness, disgust/contempt) and two regarding those of the perpetrator (fear, total number of emotions displayed). This result may indicate that RoD/IPV can be of use in exploring an offender's ability to interpret and process facial expressions and emotional reactions, a cornerstone of empathic ability (de Vignemont & Singer, 2006), which has been postulated as lacking in IPV offenders (Marsh & Blair, 2008; Marshall & Holtzworth-Munroe, 2010).

With regard to the level of violence chosen by the participants, as reflected by the endpoint (non-violent, some violence, violent) at which they arrived in the free choice trial, there were no significant differences between the study groups. However, it is noted that none of the participants in the non-IDAP group made choices limiting the couple's interactions to a verbal dispute. Although this did not reach statistical significance, it may indicate that there is a need for IPV offenders, who have not previously undergone treatment with IDAP, to learn non-violent strategies and behaviours to be used in conflict situations and should be explored further.

The majority of participants in all three groups reported that they found the RoD/IPV comprehensible, realistic, emotionally engaging, and thought it could be of use for treating IPV, despite significant differences in, among other things, level of intelligence, education, and computer literacy between the groups. Also, none of the participants aborted the simulation. Findings such as these indicate good tolerability. The majority of participants reported that they felt "negatively affected" when using the simulation. This was initially interpreted as a necessary consequence of a violence simulation program to be used in treatment, as it allays fears that the program may provide enjoyment or inspiration for violent acts, a possible ethical criticism of violence simulation (Media Violence Commission, 2012). However, this finding was further explored in detail in study IV, which investigated self-reported and psychophysiological reactions to the violent and non-violent film sequences in the RoD/IPV.

The findings above, despite a small sample size, show differences in the participants' interpretations of simulated characters' emotions depending on if the participant was an offender, an offender having undergone treatment with IDAP, or a control person. The results indicate that, at a group level, these differences cannot be readily explained by disparity in the participants' experiences of the simulation system (e.g. if they found it hard to understand), or their propensity for making more or less violent choices in the program, as there were no differences between the groups in this regard.

4.4 STUDY IV

There were significant differences in self-reported levels of arousal and valence on the SAM scale with participants scoring almost twice the arousal and half the valence after viewing the violent clips (mean arousal 6.0, mean valence 2.7) versus after viewing the non-violent ones (mean arousal 3.5, mean valence 6.0). The order in which the clips were viewed appeared to have no effect. There were no significant differences between the mean HR and SCL between

the three types of film or in the change in HR and SCL from the HCR and SCL measured during the control clip, as illustrated in Table 9 and Figures 6 and 7.

Table 9. Mean (standard deviation) HR, SCL and subjective ratings of arousal and valence across all film clips (n=20)

Measure	Control clip mean (std)	Non-violent clip mean (std)	Violent clip mean (std)	Test statistic (p)
Mean HR (bpm)	74.158 (8.12)	73.284 (13.45)	72.583 (7.34)	0.803 (0.669) ^a
Mean SCL (mS)	9.248 (9.47)	9.836 (9.43)	10.738 (11.01)	0.298 (0.862) ^a
Arousal (SAM scale)	-	3.5 (1.88)	6.5 (1.47)	354 (0.000) ^{a*}
Valence (SAM Scale)	-	6.0 (5.5)	2.7 (1.42)	24.5 (0.000) ^{a*}
Change in HR from Control (bpm)	-	12.946 (22.44)	15.550 (26.08)	172.5 (0.461) ^b
Change in SCL from Control (mS)	-	0.908 (1.56)	1.833 (2.30)	250.5 (0.174) ^b

*significant difference at the 0.05 level (2-tailed)

^a K; = using Kruskal-Wallis

^b U; using Mann-Whitney U test

Figure 6. Mean HR and SCR measured during Control Non-violent and Violent film clips

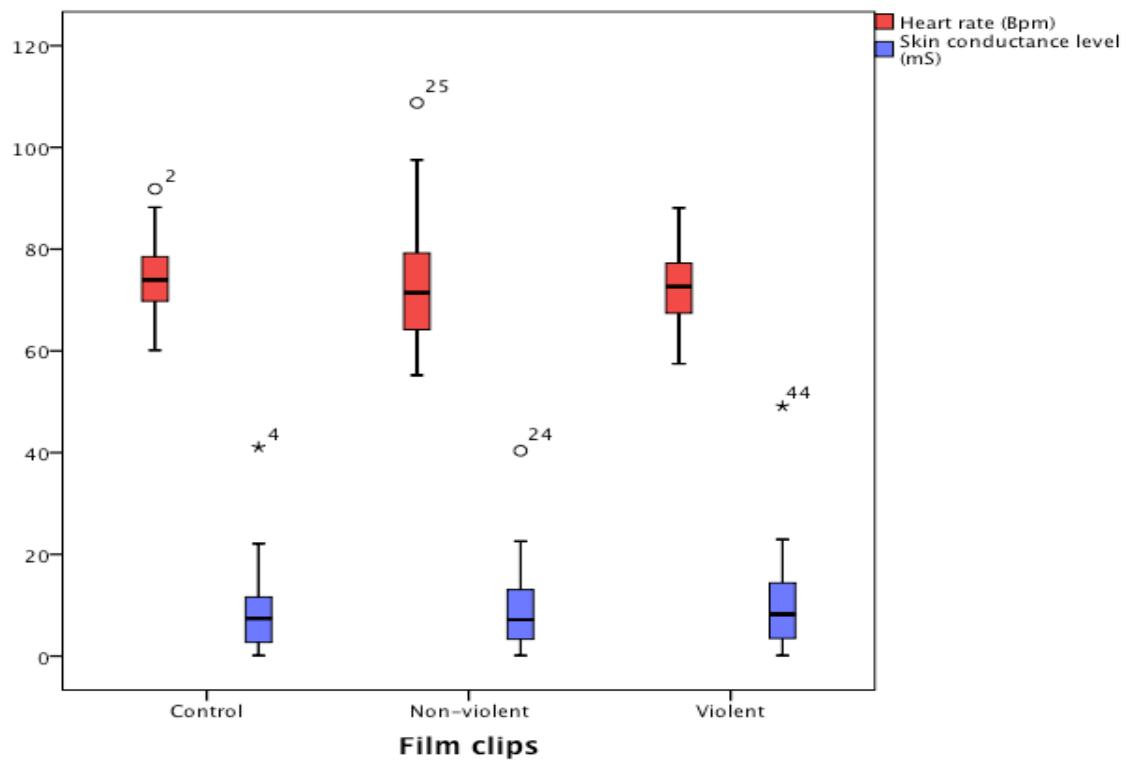
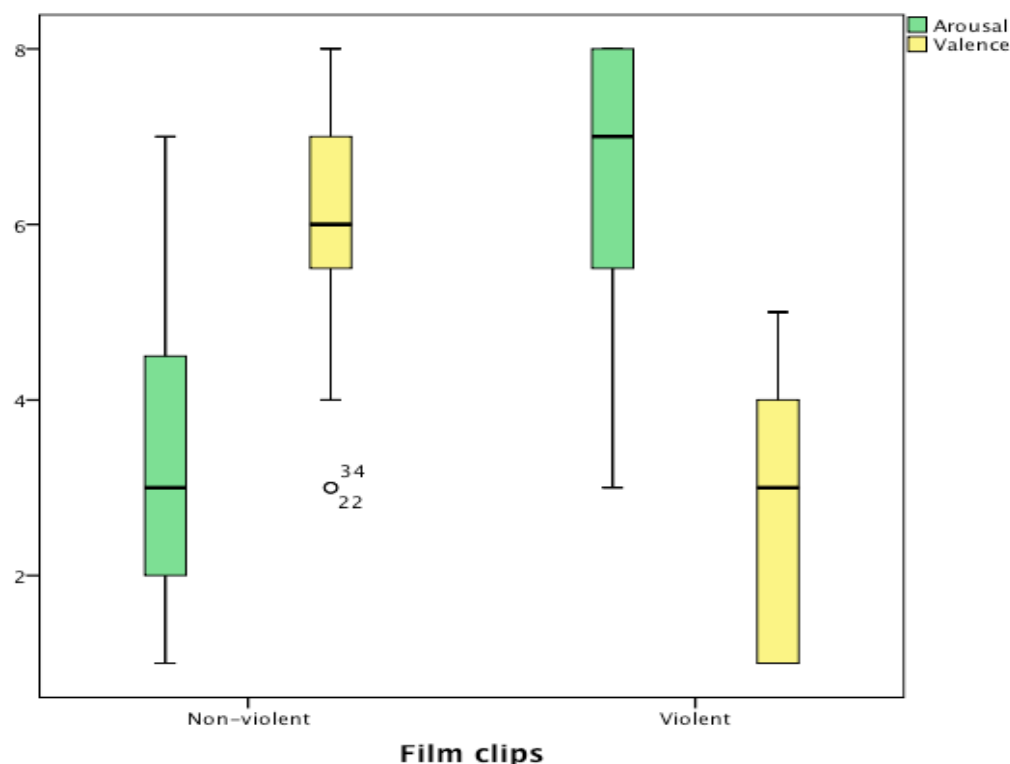


Figure 7. Arousal and valence ratings in the non-violent vs. violent film clips



4.4.1 Comments

The above results imply that when the violent film sequences in the RoD/IPV stand alone, they elicit a subjective feeling of increased arousal and decreased valence (i.e. negativity/decreased pleasure), on the SAM scale, but not to a degree that is significantly physiologically detectable by measuring HR and SCL. This clearly differs from the results of psychophysiological studies using threatening or violent film sequences or pictures as stimuli to directly induce negative emotions, which show both a physiologically detectable and self-reported stress/aversion response (Choi et al., 2011; Kreibig, 2010; P. J. Lang et al., 2008; Wahlund, Sorman, Gavazzeni, Fischer, & Kristiansson, 2010). In a review of autonomic nervous system activity in emotion, Kreibig (2010) labelled a response pattern like the one found above as “mood”. She defined mood as a diffuse and long-lasting affective state which does not directly induce a change in behaviour in the same way as a distinct emotion but does have a bearing upon how much effort is put into future behaviour. That the violence in the RoD/IPV induces a mood with negative valence (decreased pleasure) is concluded to be a positive finding for two reasons; 1) it indicates that the violent film content of the RoD/IPV is an insufficient stimulus to cause a strong aversive reaction in a group of men taken from the normal population. This is thought to allay fears that the violent film content in the RoD/IPV program may offend or disturb users to such a degree that it interferes with treatment and assessment. 2) It suggests that the RoD/IPV is not likely to be sought after for sensation-seeking or entertainment purposes, as it does not generate physiological arousal and feelings of positivity, in the same way as violent games do (A. Lang et al., 2015).

5. GENERAL DISCUSSION

5.1 CONCLUSIONS

5.1.1 Study I

There was no significant association between the gender of the simulated offender and the judgement, by forensic psychiatric assessors, that the offender suffered from an SMD and was in need of compulsory, in-patient forensic psychiatric care. However, a simulated offender depicted as having mental retardation was more likely to be assessed as at high risk of criminal recidivism if portrayed as female, regardless of the sex, place of work, or level of experience of the assessor.

5.1.2 Study II

There were significant differences between mentally disordered violent offenders and controls in the area of interpretation of the simulated characters' emotions and physical reactions, and the MDOs chose more violent actions on behalf of the main character compared with controls. There were also incongruent or deviant responses made by individual MDOs. This indicates that the RoD/RP has the ability to differentiate between MDOs and controls in several ways.

5.1.3 Study III

RoD/IPV was well received and understood, both by IPV offenders and healthy, non-offender controls. Significant differences between the groups emerged in the area of interpretation of the simulated characters' emotions. Offenders who had not undergone IDAP showed a trend towards making more violent choices than other IPV offenders and controls.

5.1.4 Study IV

In healthy, non-offender controls, the violent film sequences in the RoD/IPV elicited a subjective feeling of increased arousal and decreased valence on the SAM scale but not a physiologically detectable stress response, i.e. a negative mood. This allays fears that the film content is disturbing to a degree that it interferes with assessment/learning or is pleasurable to enough to be sought after for entertainment purposes.

5.2 METHODOLOGICAL CONSIDERATIONS

5.2.1 Total population study (study I)

Study I was conducted among the total population of fully qualified forensic psychiatrists, psychologists, and social workers employed to perform forensic psychiatric assessments on behalf of the Swedish courts, which is a methodological strength. However, the low number of responders for each case is a limitation in that it reduces the internal validity and increases the risk of overlooking real gender bias, type II error. Large confidence intervals for the relative risk of SMD, found in the borderline personality disorder and mental retardation cases, are indicative of this. A larger number of study participants or larger number of cases would have improved this and also increased generalizability. However, it was not possible to

extend the study population, as the entire target population had already been asked to participate. Had the study been carried out on two separate occasions, a higher percentage of this total population may have been included. However, this would almost certainly have removed blinding to gender, as once the participants had completed the study, they immediately started discussing the cases over coffee and cake, figured out that they had assessed the same cases but offenders of different sexes, and came to the conclusion that the true purpose of the study was related to gender bias. A larger number of cases would be likely to have reduced the number of assessors willing to take time out of their working day to participate, and a larger number of less detailed cases would have made the cases too dissimilar to forensic psychiatric court reports to be of clinical value.

5.2.2 Studies of mentally ill and incarcerated individuals (studies II and III)

In studies of incarcerated individuals, probationers, and involuntary patients, it is of paramount ethical importance to be cautious in the introduction of a new treatment or assessment method lest it lead to destabilisation of their clinical condition and/or frustration and violence. This could potentially jeopardise a planned early release or discharge, despite assurances that participation in the study will not directly affect the participants' length of incarceration, probation or involuntary hospital care. It is therefore important that new methods are introduced cautiously, in pilot form (section 5.2.3).

In study II, comprising persons with severe mental disorders, it was considered particularly important to keep the study protocol short and thus to obtain as much of the information as possible from patient records. For example, level of intelligence was measured in studies III and IV but not in study II, which may be regarded as a limitation of the study. Inherent in studying a group made up of persons who are as ill as these, is that many of them will be unable to participate in all parts of the study due to fluctuations in their clinical condition. It was also deemed inappropriate to ask them about reasons for drop out between experiment 1 and 2, lest they interpreted this as coercion. However, the treating clinicians did inform the researchers that a few of the subjects could not participate in experiment 2 as they were experiencing a fluctuation in their clinical condition, had been granted leave outside the hospital or had stated that they had enjoyed participating in experiment 1 but that they didn't see any reason to participate again. Out of the participants in study III, only the non-IDAP group was incarcerated, however, the participants in the IDAP group were on probation and therefore under obligation to be in contact with the probation service through which the research group came into contact with them. It was deemed important that these participants were reminded that participation was entirely voluntary at all times. This may have led to a few persons refusing to perform the Raven's SPM, after attempting a few questions, because they felt it was "too boring". Had attempts been made to motivate them to carry on, they may have completed all tests, however, this would have been unethical, particularly in studies involving participants of this type. However, it adds to the validity of the finding that no participant prematurely quit the simulations as evidence of the RoD/RP and RoD/IPV being acceptable to the users.

5.2.3 Pilot studies (studies II-IV)

The studies of the RoD/RP and RoD/IPV were pilot studies of new possible assessment and treatment methods for violent offenders. They were specifically designed as a pilot studies to determine if it would be scientifically and ethically justifiable to perform larger, longitudinal and randomized trials in these groups of individuals, in accordance with recommendations for good practice regarding pilot studies (Lancaster, Dodd, & Williamson, 2004). When testing a completely new assessment or treatment method within a specific population, numbers must be kept small and different aspects tested sequentially, so as to facilitate prompt discontinuation should adverse effects arise, such as destabilisation of the underlying medical condition (see 5.2.2. above). For this reason, the subjects were exposed to the RoD/RP and RoD/IPV during a few short sessions (a cross-sectional method) and this data published and peer reviewed (the main body of this thesis work), before the research group can progress to designing longer assessment and treatment protocols which may be compared to established assessment and treatment methods and followed in studies with a longitudinal design such as randomised controlled trials (section 6.2).

Due to the pilot-type nature of studies II-IV, the study population was small, which reduces internal validity and increases the risk of type II error, the risk of failing to reveal real differences between the groups. However, significant differences were found between patients and controls, despite the small sample size, and no adverse effects appeared to arise.

In study III, an investigation of the subjects' background characteristics revealed differences with regard to level of intelligence, education, computer literacy, drug and alcohol use, criminality, and risk of recidivism (in the case of the offenders) between the groups. It is possible that such differences may have affected the groups' choices and emotional responses on behalf of the simulated characters. A more homogenous study population would have been preferred, as correcting for these factors using statistical methods would not have been good practice, due to the small scale of this pilot study. Some differences between the two offender groups were expected upon designing the study, as factors such as severity of the crime, repeated offending, risk of recidivism, general criminality, and social circumstances are taken into account by the courts upon sentencing an IPV offender to a prison versus probation. It was not possible to find a non-IDAP offender group among men sentenced to probation in Sweden due to the fact that participation in IDAP is mandatory in order to receive a probation sentence for an IPV offence, and non-attendance causes probation to be revoked. The research group limited the non-IDAP group to persons who had received a prison sentence of less than one year, in an attempt to minimize possible disparities in the severity of the index offence between the two offender groups. It may be considered a limitation that copies of the court records for each participant, in which the index offence and the reason for pronouncing a custodial/non-custodial sentence would have been described, were not obtained.

5.2.4 Ecological validity

One of the benefits of the case vignettes and of computer simulation is that these tools inherently control for many variables, however the studies included in this thesis were created

as naturalistic studies of offenders, their assessors, and controls. It is possible that the process used for the selection of study participants in studies II-IV favoured offenders and controls who were positive towards computer simulation, developing new offender treatment methods, and openly discussing violence. A selection bias such as this would affect the generalizability of the results to other offenders, which is why randomized studies are preferred in the future (see section 6.2).

In study I, the total population of forensic psychiatric assessors was used and thus no form of selection was carried out, instead differences in the study population were described (assessor gender, level of experience, department). When applied to the significant gender difference found in this study (regarding risk assessment of the offender in the mental retardation case), these factors did not appear to be related to the outcome. However, so as not to reveal any individuals in presentations of the group data, it was not possible to break the groups down into more specific ones such as according to profession, age, and ethnic origin. A possible limitation of this study is that not all reasons for non-participation (and their relative frequencies) are accounted for, thus comparisons cannot be made between non-participants and participants.

The finding that offenders' median level of intelligence, as measured by Raven's SPM, was low, as compared with controls in study III and high among the controls in study IV, was unexpected. Intelligence was not measured in study II for reasons described above (see section 5.2.2). By definition, the population in study I had at least a three-and-a-half-year university education and a job requiring excellent written and spoken Swedish, which made intelligence tests superfluous for the purpose of this study. Research has shown that men convicted of violent crime have a lower cognitive ability than men without such convictions and that violent individuals, managed in courts, prison and probation services, and forensic psychiatric services, on average have weaker cognitive resources (Frisell, Pawitan, & Långström, 2012). This may partly explain why this difference between the offender and control groups was so large. A lower level of intelligence may be hypothesized to have a bearing on a participant's interpretations of simulated characters' emotions. Research into understanding of facial expressions suggest that emotion recognition abilities commensurate with overall developmental level in persons with intellectual disabilities (Rojahn, Lederer, & Tassé, 1995; Wishart, Cebula, Willis, & Pitcairn, 2007). However, because of the heterogeneity in level of intelligence within the study population in study III, it was possible to make the observation that a group of male offenders, with little experience of using a computer and a below average level of intelligence, were able to use and understand RoD/IPV in a similar way to a control group with a normal level of intelligence, which in itself is deemed clinically relevant.

Some other limitations to the generalizability of the studies III-IV to their target populations, MDOs (study II) and IPV offenders (study III and IV), are that only male Swedish-speakers were included in all studies, that all offenders included in the studies III were males in heterosexual relationships and none of them were mentally ill. These limits were set by the research group in order to match the inclusion criteria for IDAP in Sweden (studies III and IV) and to homogenise the offender groups. Further research on the use of RoD/FP and RoD/IPV is deemed necessary before generalizations to the entire target populations are possible. For example RoD/IPV may be tailored to other IPV offender sub-groups by creating

other scenarios, featuring, for instance, a homosexual couple or reciprocal violence within a heterosexual relationship, which creates many options for research and possible future treatment. An English-language version of RoD/IPV has already been created and presented at the National Offender Management Service in London.

In any assessment or treatment situation, the possibility of the client/participant presenting socially desirable, rather than accurate, answers must be considered, especially if this situation involves divulging information of a sensitive and incriminating nature. With regard to study I, it is thought that the blinding of the participants to gender being the main variable removed a large part of the risk of socially desirable (non-gender biased) answering. However, it is possible that e.g. the participants in the IDAP group in study III had, through IDAP treatment, learnt socially desirable answers to the questions posed in the simulation program and that this influenced their responses to the program or that the participants in study IV reported increased arousal and decreased valence following the violent film sequence believing them to be socially desirable answers. However, immersion into a computer program allows the participant to respond to an emotionally engaging simulated risk situation on behalf of a fictional character. By not having to directly answer questions as himself/herself, but indirectly (through a computer) and on behalf of someone else, socially desirable responding may be reduced in comparison with a traditional interview or treatment session. In a meta-analytic study of social desirability distortion there was shown to be less distortion in computerized versions of interviews than in face-to-face interviews (Richman, Kiesler, Weisband, & Drasgow, 1999). In a study of adolescent sexual behaviour, drug use, and violence, it was found that the use of computer technology increased participants' reporting of highly sensitive, and even illegal issues, such as if they had carried a gun or a knife in the previous 30 days (Turner et al., 1998). While socially desirable responding certainly cannot be disregarded when considering the participants' responses to the RoD/FP and RoD/IPV programs, research suggests that this issue may be less prominent in a computer simulation program than in other clinical situations.

6. CLINICAL IMPLICATIONS AND FUTURE PERSPECTIVES

This thesis work has explored the use of written and computerized case simulations in the assessment and treatment of violent offenders. In study I, the focus has been on the results provided by the simulation tool and, in the remaining studies, on the tools themselves. The results provided by study I indicate that male and female offenders are being assessed in a similar way with regard to severe mental disorder, but differently with regard to their recidivism risk, and that these assessments may vary with offenders' clinical symptomatology. It calls for further research into the conformity of assessment practice in Swedish and international forensic psychiatry, using similar methods as well as audit of actual case reports. This study also adds to the body of research advocating the development of improved methods for risk assessment of offenders (Douglas & Skeem, 2005; Skeem & Monahan, 2011), which is part of the rationale behind the computer simulation systems presented in studies II-IV. Clinically, it is important to disseminate the results of such research, e.g. through post-specialisation training and inter-collegial discussions, in order to combat possible forms of assessor bias and to continue to strive towards equality before the law for all individuals, regardless of race, gender, or religion.

The interactive computer simulation tools, studied in a pilot fashion in this thesis work, have been found to be acceptable to very varied groups of participants, to violent offenders with severe mental disorder, violent offenders with a specific subtype of violence, as well as non-offender controls. This is deemed to be of great clinical importance, as, had the interactive programs or the film-content of the RoD/IPV been found to be unacceptable to the participants (e.g. offensive, stressful, enjoyable), this would have raised serious ethical concerns about proceeding with further research into, and development of, computer simulation of violence for assessment and treatment of offenders. In both studies of the interactive simulation programs, significant differences between the study groups emerged, particularly with regard to their interpretations of the simulated characters' emotions and also differences in the level of violence chosen on behalf of the characters. Such findings are thought to be of clinical value as they may provide additional information to traditional violent offender assessment methods (such as checklists) by showcasing dynamic risk factors (such as impulsiveness, antisocial attitudes, interpersonal interactions, difficulties in emotional processing) through the offenders' interactions in a safe replica of a real world. They may also be used to augment offender treatment through providing a motivating, engaging, safe, replicable, controlled environment in which user receives feedback from which he can learn and a performance record is available for analysis and discussion with a treatment provider (Douglas & Skeem, 2005; A. A. Rizzo & Kim, 2005; Skeem & Monahan, 2011).

In order to further develop and study simulation methods in the context of violent offenders in a clinically useful way, it is likely that a series of optimised protocols have to be developed. This is based on the rationale that although learning and retention from computer simulations has been found to be superior to traditional instruction methods, they were found to be further improved by e.g. multiple training sessions, when augmented with other instruction methods and when working in groups (Wouters et al., 2013). For instance, a short

intervention based on the RoD/IPV could be designed for the treatment of IPV offenders. It would be meaningful to study it paired with current standard treatment compared with only current standard treatment, in a randomized controlled trial in which outcome is measured in terms of recidivism rates. As most IPV offenders sentenced to probation are currently obliged to undergo IDAP and many prisoners chose to do so, it would be difficult to randomize to any new experimental treatment method. However, a keen interest in the program has been shown by both the programme development department of the Swedish Prison and Probation Services, and is in fact already being incorporated into a CBT-based IPV intervention, and also by organisations working with men at risk of committing IPV offences, with a view to using RoD/IPV primarily as a motivational and teaching tool. Further research, however, is recommended, particularly with longitudinal follow-up of recidivism rates, preferably with a randomized controlled study design, before implementing the RoD/IPV in treatment.

A welcome future development of these simulation programs, and programs like them, would be to create multiple scenarios and to make them fully computer animated. This would allow variables in them be changed so as to be able to tailor them specifically to different clientele e.g. IPV within homosexual couples, female offenders, offenders speaking different languages, groups for whom it is difficult to provide specific treatment today. The inclusion of voice recognition software and other virtual reality features would also be likely to greatly enhance a users' ability to engage with the simulation. Also, pairing computer simulation technology with other forms of computerised technology now making an entrance into mainstream health care assessment and treatment, e.g. internet-based treatment programs for depression and an electronic general practice, could lead to huge gains for both patients and clinicians around the world.

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