Hostile Attribution Bias as a Dynamic Risk Factor in Civil Psychiatric Patients and Criminal Offenders: Change over Time and Relationship to Violence and Recidivism

by

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Abstract

Clinicians in applied forensic and clinical settings are increasingly asked to address the issue of risk for future violence or recidivism in their day-to-day practice. Given the severe consequences of under- and over-estimating someone's level of risk, a vast body of research has identified risk factors associated with these adverse outcomes. Dynamic risk factors can be especially useful from a risk management perspective; however, to date some dynamic risk factors, such as hostile attribution bias (HAB), have been largely ignored in the literature, and little is known about the dynamic nature of the HAB.

The purpose of this study was to examine whether the HAB, as measured by the External Hostile Attributions Scale (EHAS; McNiel, Eisner, & Binder, 2003), is a dynamic risk factor with respect to violence and recidivism. Specifically, the aim was to determine whether the EHAS was a significant predictor of these outcomes, whether and how much the EHAS changes over time, and if certain participants showed similar trajectories of EHAS over time. Participants were 118 civil psychiatric patients admitted to a psychiatric ward of a general hospital and 56 criminal offenders who were incarcerated or on probation at the start of the study. Participants completed a semi-structured interview as well as a number of questionnaires at baseline, and completed a shorter interview and the same questionnaires at up to five follow-up interviews after discharge or release. Official criminal records were reviewed at the end of the study.

The results of this study partially supported the use of the HAB as a dynamic risk factor with respect to violence and recidivism. Some analyses showed that the EHAS was a significant predictor of violence and recidivism, especially in the short-term; findings also indicated that EHAS scores changed over time for a subset of the sample, and that there were some associations between changes over time and adverse outcomes. Finally, results demonstrated that participants' scores followed similar trajectories over time and that, in some cases, trajectories of EHAS scores were associated with outcomes. Implications for risk management and treatment recommendations are discussed.

Keywords: Hostile attribution bias; dynamic risk factors; violence; recidivism; risk assessment; predictive validity

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Table of Contents

List of Tables

List of Figures

1. Introduction

Despite some evidence of decline in crime over the last few decades (e.g., Brennan, 2011; Ministry of Public Safety and Solicitor General, 2011), violent crime still represents 21% of the crimes committed each year in Canada and, in 2011, police reported over 424,000 violent incidents (Statistics Canada, 2012). In addition, rates of reoffending, or recidivism, have been found to be as high as 44% within one year of release from a federal prison (Bonta, Rugge, & Dauvergne, 2003), and approximately 30% over two years for offenders released from jails in British Columbia (Ministry of Public Safety and Solicitor General, 2011). Violence and offending have important economic (e.g., incarceration, healthcare) and psychological (e.g., trauma, stress) costs for victims and perpetrators alike (Green & Roberts, 2008; Kluft, Bloom, & Kinzie, 2000; Public Safety Canada, 2011).

As a result, practitioners in clinical and forensic settings are increasingly asked to address the issue of risk for violence or recidivism for patients and offenders in order to protect the public from potential future harm. In addition, Canadian civil commitment law requires that individuals with mental illness who pose a danger to themselves or others be admitted to a psychiatric facility and remain committed until they are no longer a threat to themselves or others (e.g., Douglas & Koch, 2001). Although provinces define mental illness and dangerousness differently, there is a consensus that individuals who may be dangerous should remain in hospital. As such, violence risk assessment is a common referral question in such settings. Given the severe consequences associated with both under- and over-estimating someone's level of risk for violence or recidivism, it is important to identify the risk factors contributing to these adverse outcomes. Research has identified two main types of risk factors: static (i.e., unchangeable) risk factors, and dynamic (i.e., changeable, amenable to intervention) risk factors (e.g., Andrews & Bonta, 1998; Andrews, Bonta, & Wormith, 2011). Dynamic risk factors are especially useful because they can be targeted through intervention, thereby potentially decreasing the likelihood of violence or reoffending (e.g., Douglas & Skeem, 2005; Heilbrun, Nezu,

Keeney, Chung, & Wasserman, 1998). Some dynamic risk factors (e.g., substance use, negative attitudes) have been researched to a larger extent than others; however, more investigations of less well-researched risk factors are needed to enhance clinicians' performance in prevention and risk management.

The present study examines violent behaviour and recidivism among civil psychiatric patients and criminal offenders living in the community. Specifically, this study investigates the hostile attribution bias (HAB) as a possible dynamic risk factor for prospective violence and recidivism among civil psychiatric patients and criminal offenders. Based on theoretical and empirical support, the HAB was identified as a promising dynamic risk factor for adverse outcomes that deserves further empirical investigation. This dissertation begins with a review of research describing risk assessment, dynamic risk factors, and adverse outcomes. Then, the construct of the HAB is explored, and research supporting its use as a dynamic risk factor pertaining to risk assessment is outlined. Following this, the study methodology and data analytic plan are presented. Finally, the results as well as their implications in the context of risk assessment for adverse outcomes are discussed.

1.1. Risk Assessment

Transformations in correctional and mental health systems have shortened patients' and offenders' length of stay in institutions, and risk assessments are performed to achieve a balance between individuals' rights to liberty, costs of incarceration or hospitalization, and safety to individuals in the community (e.g., Douglas & Skeem, 2005; Skeem & Monahan, 2011).

Traditionally, three different approaches to decision-making for risk assessment and risk management have been used, namely unstructured clinical judgment, actuarial risk assessment, and structured professional judgment (SPJ). In unstructured clinical judgment, clinicians are given absolute discretion in incorporating the available information and making a decision (Grove & Meehl, 1996). Although this has some advantages, such as focusing on individual characteristics and how they relate to management and intervention strategies (Douglas & Kropp, 2002; Melton, Petrila,

Poythress, & Slobogin, 2007), this approach has a number of weaknesses in that clinicians may rely on irrelevant risk factors, incorrectly disregard crucial ones, and there may be inconsistencies in decisions across as well as within evaluators (Dawes, Faust, & Meehl, 1989; Grove & Meehl, 1996).

In the actuarial approach, risk factors are typically combined according to a pre-existing algorithm having been tested on calibration samples with the outcome of interest (Meehl, 1954); however, the calibration samples may not be representative of the individual assessed and are based on group prediction, which may not be applicable to every individual. Actuarial decision-making has some strengths, such as reliance on risk factors with strong empirical support, operational definitions, and specific instructions for coding and combining risk factors (e.g., Dawes et al., 1989; Hart, 1998). However, actuarial risk assessment also has a number of weaknesses, such as the potential to omit factors unique to a specific individual, inappropriate weighing and calibration for specific samples, and a limited influence on real-world decision-making (e.g., Douglas & Reeves, 2010; Hart, 1998).

Finally, the SPJ approach imposes structure on a select number of risk factors, providing instructions and scoring rules for each risk factor, and providing instructions on how to determine the level of risk (Douglas & Reeves, 2010; Heilbrun, Douglas, & Yasuhara, 2009), thereby allowing transparency in the process and incorporating an individualized approach to risk assessment and management. As such, in this approach clinicians rely on a list of empirically supported, but rationally derived risk factors, and choose how much emphasis to give each risk factor according to the personal circumstances of the individual being assessed (Douglas, Blanchard, & Hendry, 2012).

Given that these approaches rely on a number of risk factors having been associated with the outcomes of interest, it is important to conduct more research to establish new risk factors for inclusion in risk assessment and management tools. Inclusion of additional risk factors has the potential to enhance the accuracy of the decision-making, and therefore to reduce the risk of harmful outcomes.

1.2. Risk Factors

A large body of research thus far has focused on static risk factors, or risk factors that are not amenable to change over time, such as the age at index offence or school maladjustment as a child (e.g., Quinsey, Harris, Rice, & Cormier, 1998). Historically, the tools incorporating only static risk factors were developed with the intention of making single time-point predictions for future behavior (e.g., parole, release), and most research on dynamic risk factors has also treated these risk factors as static by measuring them only once, thereby not allowing them to demonstrate change over time (Douglas & Skeem, 2005).

Although risk assessment tools incorporating static risk factors, such as the Violence Risk Appraisal Guide (VRAG; Quinsey et al., 1998), have good empirical support and have been shown to predict harmful outcomes (e.g., Campbell, French, & Gendreau, 2009; Guy, 2008; Fazel, Singh, Doll, & Grann, 2012; Singh, Grann, & Fazel, 2011; Yang, Wong, & Coid, 2010), the overreliance on static risk factors has some limitations. One of the most important shortcomings of static risk factors is that they are unable to change over time. That is, static risk factors will not change through treatment and intervention, and, as a result, the estimated, as opposed to actual, risk level of the individual being assessed is likely to remain static if only such risk factors are being taken into consideration (e.g., McDermott, Edens, Quanbeck, Busse, & Scott, 2008). For this reason, a number of authors suggest that clinicians and researchers include dynamic, or changeable, risk factors into their evaluations or risk assessment tools.

Douglas and Skeem (2005) defined causal dynamic risk factors for violence as possessing three components, namely that the risk factors "precede and increase the likelihood of violence (i.e., be a risk factor), change spontaneously or through intervention (i.e., be a dynamic factor), and predict changes in the likelihood of violence when altered (i.e., be a causal dynamic risk factor)" (Douglas & Skeem, 2005, p.351).

It has been suggested that dynamic risk factors can be grouped into two categories: stable dynamic and acute dynamic risk factors (Hanson & Harris, 2000). Stable dynamic risk factors are considered to be more trait-like and are expected to remain stable over months or years, such as impulsivity and alcoholism. Because of

their enduring quality, it is hypothesized that interventions need to target stable dynamic risk factors in order to create long-lasting improvements in reoffending (Hanson & Harris, 2000). Acute dynamic risk factors, on the other hand, can change very rapidly (e.g., within minutes, hours, or days). Examples of acute dynamic risk factors are mood, substance use, and anger. Acute dynamic risk factors are not necessarily associated with long-term recidivism but are useful as they can signal the timing of an offence (Hanson & Harris, 2001). Although thus far researchers have been able to identify a number of putatively dynamic risk factors, very little research has examined the rate or rapidity of change within these risk factors.

Despite this, a number of risk assessment tools have incorporated dynamic risk factors (e.g., HCR-20; Webster et al., 1997), thereby allowing clinicians to see changes resulting from intervention as well as to monitor the risk for violence over time in an effort to prevent violence (Hart, 1998). This poses a particular challenge for clinicians as the rapidity of change in risk factors impacts the shelf-life of the assessments and, as mentioned above, little research is available with respect to the speed with which dynamic risk factors fluctuate.

1.3. Predictive Utility of Dynamic Risk

A small number of studies in the literature have examined dynamic risk. While a large number of studies have examined the relationship between supposed dynamic risk factors at a single time-point and violence, these studies have relied on inter-individual differences in dynamic risk factors (Douglas & Skeem, 2005; Skeem & Mulvey, 2002). Although the information collected through these studies is important, it provides no information regarding the change in risk factors within individuals over time (i.e., intra-individual change), which is the goal of clinical-forensic practice.

Some research has investigated how changes in dynamic risk factors are related to aggression and delinquency in children and youth (e.g., Brame, Nagin, & Tremblay, 2001; Kochenderfer-Ladd & Wardrop, 2001; McDermott & Nagin, 2001; Spieker et al., 1999), but the results are not entirely relevant to adults given the developmental dependency of risk factors. To date, little research has examined the extent to which

dynamic risk factors fluctuate over time (i.e., the extent to which they are dynamic), and the extent to which changes in risk factors are related to outcomes, in adult populations.

As such, this review will focus on dual time-point estimates as well as multiple time-point estimates of dynamic risk. Dual time-point estimates, although useful to examine whether and how much risk factors change over time, are limited by the fact that one can only infer a linear change (i.e., increasing, decreasing, or remaining the same), whereas the actual trajectory of the risk factors may be curvilinear (see Kochenderfer-Ladd & Wardrop, 2001; Spieker et al., 1999). Nevertheless, a number of dual time-point estimate studies have examined the relationship between changes in risk factors and violence.

Hanson and Harris (2000) found evidence for some risk factors adding incremental validity to static risk factors in a sample of 400 sex offenders. Their results suggest that changes in social influence and anger across two measurements were useful dynamic factors above and beyond static risk factors in predicting sexual recidivism, such that these dynamic factors contributed unique variance after controlling for static risk factors. There were, however, a number of problems with this study, including its retrospective nature, the reliance on probation officers' recollection of offenders' behaviour months prior to recidivism, and the fact that the probation officers were not blind to whether the offenders had recidivated. The combination of these factors may have led to inaccurate information.

A small number of studies have investigated the relevance of dynamic risk factors prospectively. For example, one study of incarcerated sexual molesters showed that, out of 26 dynamic risk factors, changes over two time-points in eight dynamic variables (e.g., trait and suppression of anger, perspective-taking) were significant predictors of sexual violence (Hudson, Wales, Bakker, & Ward, 2002). Two studies using the Level of Service Inventory – Revised (Andrews & Bonta, 1995) demonstrated that increases in LSI-R scores over two time-points were significant predictors of recidivism (Andrews & Robinson, 1994; Motiuk, 1993).

Further, in a sample of 595 forensic patients, Quinsey, Jones, Book, and Barr (2006) found that increases in ratings on several subscales of the Proximal Risk Factor

Scale (PRFS; Quinsey, Coleman, Jones, & Altrows, 1997) (e.g., Dynamic Antisociality, Poor Compliance, Therapeutic Alliance) and the Problem Identification Checklist (PIC; Rice, Harris, Quinsey, & Cyr, 1990) (e.g., Antisocial Behaviour, Therapeutic Alliance) showed changes from month to month, and that those changes were predictive of violent and non-violent incidents. Results using the Dynamic Risk Appraisal Scale (Quinsey et al., 2006) also suggested that there are different trajectories in risk factors for individuals who are at higher risk for committing new offenses compared to individuals at low risk for recidivism. That is, scores on the Generic Risk subscale predicted incidents for low and high risk patients; however, being released under supervision predicted incidents only in the low-risk group. Finally, only changes in the Violence Risk subscale were predictive of violent incidents (Quinsey et al., 2006).

As mentioned above, although helpful, dual time-point studies are not ideal examinations of dynamic risk because they cannot account for curvilinear relationships in dynamic risk factors. For these reasons, studies of multiple time-point estimates have become increasingly common over the last few years. Advantages of these types of studies include the ability to measure different patterns and trajectories of change, as well as whether changes in dynamic factors predict outcomes.

One large study of multiple time-point estimates in a sample of psychiatric patients had 26 repeated measurements of risk factors presumed to be dynamic, which involved weekly assessment of these risk factors over 6 months, as well as their relationship to violence (Mulvey, 2002). Findings at the weekly level showed that participants classified as “high risk” for community violence exhibited significant changes in psychiatric symptoms over time; further, results also demonstrated that individuals who exhibited more rapid fluctuations in levels of symptoms were more likely to be violent during the follow-up, and were more likely to be involved in a higher number of serious violence incidents than individuals who exhibited slower changes in symptoms. One major limitation of this study is its generalizability; specifically, it is unknown whether these findings would generalize to other populations and individuals classified as “low” or “moderate” risk for community violence (Odgers et al., 2009).

In another study using the same sample of high-risk participants, Skeem and colleagues (2006) examined the relationship between weekly levels of anger, anxiety,

depression, and threat/control override (TCO) symptoms and the perpetration of violence in the following week, over a 26-week period. Results indicated that increased anger at one time point was significantly predictive of serious violence within the next week, but that none of the other psychiatric symptoms showed this pattern. In addition to generalizability, the authors mention that their focus on specific constructs was a limitation of their study, as they may have missed important dynamic factors. Findings at the daily level (Mulvey et al., 2006) demonstrated that substance use and violence occur in acute bursts and tend to co-occur on a given date. Results also showed that use of marijuana on any given day was a significant predictor of violence on the day following drug use. However, the data were only analyzed with a three-day lag period, and as such it is impossible to know whether the effects of the substance use may have lasted for a longer period of time (Mulvey et al., 2006).

In a sample of 136 adult male offenders on probation, Brown, St-Amand, and Zamble (2009) examined the extent to which static and dynamic risk factors could predict criminal recidivism using a three-wave, prospective design. Dynamic risk factors were assessed prior to release as well as one and three months post-release, and recidivism data were, on average, available for a 10-month follow-up period. The authors stated that the greatest predictive accuracy with respect to recidivism was found when both static and dynamic risk factors were included in the analyses, and the predictive accuracy of the static model was comparable to that of the dynamic risk model.

When considering only dynamic risk factors, Brown and colleagues (2009) reported that dynamic factors such as employment, substance use, financial status, criminal association, perceived problems and stress, coping ability, and social support differentiated between recidivists and nonrecidivists in the expected direction. The dynamic risk factors showing the strongest empirical support were employment, marital support, negative affect, perceived problem level, substance use, social support, and expected positive consequences of crime. Overall, this study is one of the few studies having investigated a number of dynamic risk factors in criminal offenders over time using a prospective design, and these findings demonstrate that dynamic risk should be taken into consideration in correctional settings.

A study by Douglas, Strand, and Belfrage (2011) examined changes in the Clinical (C) scale of the HCR-20 (Webster et al., 1997) over four time points, six months apart, in a sample of 174 forensic psychiatric inpatients in Sweden. Results demonstrate that the C scale showed a significant change over time; that is, it showed a statistically significant linear decrease over the four time points. A repeated-measures ANOVA showed that this decrease was predictive of violence over that time period. These analyses were limited to the C scale; however, it would be useful to perform similar analyses using the Risk Management (R) scale of the HCR-20, as its risk factors focus on management for the near future.

Using a pseudo-prospective design, Wilson, Desmarais, Nicholls, Hart, and Brink (2013) examined whether within-individual changes (i.e., assessed every three months for one year) on the HCR-20 and the Short-Term Assessment of Risk and Treatability (START; Webster, Martin, Brink, Nicholls, & Desmarais, 2009) were related to institutional violence in the three months following each assessment. In their sample of 30 male forensic inpatients, Wilson and colleagues found that changes in dynamic factors were associated with institutional violence. Specifically, results demonstrated that the C and R items on the HCR-20, as well as the START strength and vulnerability items, were significant predictors of institutional aggression; in addition, these dynamic risk factors were better at predicting outcomes over the short-term than over the long term. Although it was one of the first research studies demonstrating that changes in dynamic risk (and protective) factors are associated with institutional violence, the authors mention some limitations, such as generalizability of their findings to females, other samples (e.g., correctional, civil psychiatric), and the management of risk in the community, as well as sample size (Wilson et al., 2013).

In a sample of male patients with schizophrenia from both civil and forensic psychiatric hospitals, Michel and colleagues (2013) examined changes in HCR-20 Clinical (C) and Risk Management (R) scales at four 6-month intervals to determine whether these scales were dynamic. Results demonstrated that the C and R scales changed significantly over time in both subsamples, and that there was a pattern with which scores, overall, tended to decrease over time rather than increase. Results also indicated that some C and R scale items were significantly predictive of increased aggression in the six months following the assessment. The authors argued that their

results suggest that the items on the C and R scales may be more dynamic than was previously reported (Michel et al., 2013); this underscores the importance of examining dynamic risk factors on more than one occasion.

Using data from the prospective Re-Entry: Dynamic Risk Assessment study, Morgan, Kroner, Mills, Serna, and McDonald (2013) examined whether dynamic variables related to the psycho-social functioning of male offenders were predictive of performance post-release, as well as whether these variables accounted for variance above and beyond static variables. Contrary to hypotheses, results demonstrated that the dynamic risk factors did not significantly improve predictive accuracy beyond static risk factors when predicting risk. Further, although some variables were predictive of community failure (i.e., interruption of care, impoverished housing situations), results showed that changes in dynamic functioning over time were not significantly associated with post-release outcomes. The authors suggest the possibility that criminal risk may not be a dynamic process but rather a static one, with individuals remaining at their baseline level of risk despite changes in relevant risk factors (Morgan et al., 2013).

In a sample of 662 male offenders, Kroner and Yessine (2013) examined whether a 25-session cognitive-behavioural intervention targeting criminal and antisocial attitudes (Graham & Van Deiten, 1999) could decrease recidivism in offenders under community supervision following release from federal prison. The authors found that, at the group level, the intervention was successful in reducing recidivism; however, at the individual level, the within-person pre-to-post intervention changes were not as successful, with only 4% to 14% of individuals showing a reliable change, depending on the variables. In addition, at the individual level, only the variable measuring attitudes toward associates, which was not a central focus of the treatment program, was associated with recidivism (Kroner & Yessine, 2013). Therefore, additional research investigating within-person change is needed, given the inconsistency in the recent literature.

Serin, Lloyd, Helmus, Derkzen, and Luong (2013) completed a review of the literature which included 53 studies in total, 49 of which explicitly tested the relationship between intra-individual changes in risk factors and recidivism. The authors included studies having been conducted with violent offenders, and narrowed their focus to

include three domains: cognition, violence, and substance misuse. Overall, the results demonstrated significant association, with small to large (i.e., d = 0.06 to 1.48) effect sizes, between intra-individual changes in risk factors and outcomes. The most relevant findings for the current study appeared within the "cognitive" domain, where changes in risk factors such as negative emotions (i.e., anger, hostility) and antisocial attitudes were significantly related to outcomes; however, the authors caution against the over-reliance on these findings due to methodological issues, especially with respect to anger and hostility findings, where the number of studies included was quite small (n = 2), had not been replicated, and had questionable study designs (Serin et al., 2013).

In sum, a number of these studies have shown the rapidity with which risk factors can change, the imminence of violence as a result of some dynamic risk factors, and the growing research demonstrating the link between risk factors and outcomes using multiple time-point estimates. However, the studies mentioned above have only focused on a fraction of the dynamic risk factors relevant in assessing risk for violence and recidivism. As such, prospective investigations of other dynamic risk factors over multiple time-points are needed.

1.4. Exploring Different Patterns of Change

Most of the past research having examined changes in risk factors over time has done so by examining whether and how much entire samples changed over time (e.g., Brown et al., 2009; Michel et al., 2013; Mulvey et al., 2006). This raises an important concern, which is that doing so presumes that entire samples exhibit similar changes; that is, it assumes that every individual in a sample changes in the same way, or at the very least averages across different forms of change. A more probable occurrence would be that, in a sample of individuals, some may get better, some may get worse, and some may remain the same. Therefore, important information about subgroups of individuals may be missed if the focus is on group differences over time. For instance, analyses may indicate that there is no change over time on a measure; it is possible that there truly is no change, in that individuals did not get better or worse; alternatively, it is possible that the non-significant results may be driven by aggregating the data (i.e., a subgroup of individuals got better and another group of individuals got worse). In this

example, valuable information pertaining to different trajectories over time would be lost due to the inclusion of all participants.

Very little research examining whether certain individuals follow similar trajectories over time with respect to dynamic risk factors exists. One of the only studies having investigated this issue was the aforementioned study by Douglas and colleagues (2011), where cluster analysis was used to determine whether different groups of patients showed different patterns of change over time on the C scale of the HCR-20. The authors found that there were five different patterns of scores over time; three of the five groups showed a linear decrease over time, but started off with different C scale scores, and the two other groups also started off at different scores on the C scale and showed a variable pattern of scores across time (e.g., initial increase, then decrease, then increase) (Douglas et al., 2011). The results of this study were important in providing initial support for the examination of different "clusters," or subgroups, of individuals who may be exhibiting similar trajectories within a dataset.

Despite the paucity of studies examining individuals' trajectories in dynamic risk factors related to violence, a large body of research has focused on examining developmental trajectories. Techniques such as cluster analysis (as used in Douglas et al., 2011) and group-based trajectory modeling (for a recent review, see Nagin & Odgers, 2010) are being increasingly used to examine the developmental course of a variable (e.g., symptoms, behaviours), as they are able to identify groups of individuals who are behaving in the same way on variables of interest. Thus far, these techniques have been able to detect developmental trajectories in research on delinquency and antisociality (e.g., Land & Nagin, 1996; Nagin & Tremblay, 1999), crime trends (e.g., Weisburd, Bushway, Lum, & Yang, 2004), anxiety (Côté et al., 2002), and weight (e.g., Mustillo et al., 2003). Given the need for more research on trajectories, these techniques should continue to be applied to dynamic risk factors in forensic assessment.

1.5. Hostile Attribution Bias

One putatively dynamic risk factor which, compared to others (e.g., substance use, negative affectivity), has been largely ignored in the risk assessment literature is the

HAB. The HAB is typically thought to be an error in thinking that is one component of social cognition, which refers to the way in which individuals perceive and interpret social situations (Sternberg, 1994). Many aspects of social cognition have been the object of research (e.g., encoding and retrieving information, storage of information), and one of the topics most studied in social cognition is that of attributional styles (Buchanan & Seligman, 1997).

Attributional styles have been widely described as developmentally-acquired personality characteristics (Seligman, 1990), and are defined as a pattern of attributing cause for an event or behaviour to ultimately help shape an emotional or behavioural response (Weiner, 1995). That is, an attributional style is a way in which individuals explain themselves and the world around them.

To explain how people experience a particular event, Buchanan and Seligman (1997) postulated that individuals make attributions about situations using three components: the cause of an event can vary with respect to how personal (i.e., internal or external to themselves), pervasive (i.e., global or specific), and permanent (i.e., stable or unstable) they can be. Further, they argue that over time, different combinations of these components can result in different attributional biases and thinking patterns. The depressive attributional style has been by far the most extensively researched attributional style (e.g., Abramson, Seligman, & Teasdale, 1978).

The HAB, also referred to as hostile attributional style, is commonly defined as a tendency to attribute hostile intent to someone when there are no social cues to that effect (Crick & Dodge, 1994). Some authors have argued that individuals who have aggressive tendencies tend to develop a bias in that they perceive others' intentions as hostile in social interactions (e.g., Blackburn, 1989). This is consistent with Dodge (2006), who describes the HAB as universally acquired in early life, although a benign attributional style is learned by most children. As such, Dodge (2006) argued that the HAB is a failure to develop benign interpretations of interpersonal situations. Although this study aimed to focus on the HAB in adults, a brief review of the extant literature on the HAB in children was conducted.

1.6. The HAB in Children

Most of the research on the HAB has been conducted in relation to aggression in children and youth. In fact, the HAB has been found to be related to aggression in samples of African American (Graham & Hudley, 1994), European American (Dell Fitzgerald & Asher, 1987), Latino (Graham, Hudley, & Williams, 1992), and Dutch children (Comodeca & Goossens, 2004) and in both elementary (Guerra & Slaby, 1989; Lochman, 1987; Sancilio, Plumert, & Hartup, 1989; Waas, 1988), and junior high school settings (Dodge & Tomlin, 1987). Further, the HAB has also been investigated in clinical settings such as youth custody centers (Dodge et al., 1990; Slaby & Guerra, 1988), child psychiatric centres (Milich & Dodge, 1984), and child guidance clinics (MacBrayer, Milich, & Hundley, 2003).

In a meta-analysis by Orobio de Castro, Veerman, Koops, Bosch, and Monshouwer (2002), the HAB was found to be a predictor of aggression in children across 41 studies with over 6000 children. The relationship had a weighted mean effect size of r = .17, though effect sizes varied considerably across studies (rs = - .29 to .65). Overall, the relationship between the HAB and aggression was significant, with larger effect sizes being positively associated with more severe aggressive behaviour. This relationship was also found regardless of methodology (e.g., vignettes and hypothetical situations, self-report, experimental situations; see Dodge, 2006).

1.7. The HAB in Non-Clinical Adult Samples

In adults, the pattern of findings has been shown to be similar to that in children. That is, most studies have found a link between the HAB and anger, aggression, violence, and criminality. For example, studies have shown that, when told that their opponents in an experiment were shocking them maliciously, adults who attributed hostility to their opponents tended to retaliate in a more aggressive and hostile manner (i.e., they would administer shocks of higher intensity than non-hostile participants) (Epstein & Taylor, 1967, Ohbuchi & Oku, 1980). Other studies have demonstrated that participants with high levels of HAB reported that they would react to hypothetical situations in a more verbally and physically aggressive manner than those with lower

levels of HAB (Dodge & Somberg, 1987; Graham, 1998; Guerra et al., 1993). In a study of workplace aggression, Homant and Kennedy (2003) showed that employees' hostile attributions toward supervisors were related to aggression in situations where the supervisors' motivation was ambiguous. Lastly, studies have shown that aggressive university students are more likely to complete sentences using aggressive wording in ambiguous and hostile scenarios than nonaggressive students (Dill, Anderson, Craig, & Deuser, 1997), and that aggressive students had a higher likelihood of attributing hostile intent than nonaggressive students (Epps & Kendall, 1995). Although useful, these studies have not focused on psychiatric and criminal samples, which is the focus of this research project. Research on the HAB in these samples is presented below.

1.8. The HAB in Offender and Clinical Adult Samples

Some studies have examined the HAB in clinical populations, and these studies have investigated the relationship between the HAB and violence as well as other criminal outcomes. In a sentence interpretation task where sentences could be interpreted either in a "violent threatening" or "neutral" manner (e.g., "The painter drew the knife"), Copello and Tata (1990) found that when comparing offenders to nonoffenders, offenders were more likely to interpret the sentences in a threatening as opposed to neutral manner, although there was no difference between violent and nonviolent offenders. In addition, there was a correlation between hostility and the tendency to interpret sentences in a threatening fashion (Copello & Tata, 1990). Moreover, Eckhart, Barbour, and Davidson (1998) found that men having engaged in intimate partner violence were more likely to display HAB than men who were satisfied or distressed with their marriage.

In a sample of 150 Caucasian and African-American offenders, Vitale, Newman, Serin, and Bolt (2005) found that hostile attributions were predictive of violence. Further, in a sample of incarcerated males, the HAB was correlated with anger, verbal aggression, and physical aggression, but not correlated with type of conviction and misconduct (Simourd & Mamuza, 2000). Lastly, one study comparing violent and nonviolent offenders demonstrated that there was a large effect size with respect to hostile attributions between the two groups, in that violent offenders had significantly

higher HAB levels than nonviolent offenders (Lim, Day, & Casey, 2010). One common limitation of these studies is that none of them measured the HAB at more than one time-point; therefore, the authors were unable to determine changes in the HAB over time.

With respect to psychiatric settings, one study found that the HAB was significantly predictive of inpatient violence in individuals with severe mental disorders (Waldheter, Jones, Johnson, & Penn, 2005). However, in a sample of civil psychiatric patients, Hendry, Michal, and Douglas (2010) did not find a significant relationship between the HAB and violence retrospectively or prospectively.

Despite the established link between the HAB and aggression in nonclinical adult populations, more research is needed in clinical samples. Further, given its potential importance in decision-making and risk assessment and risk management research pertaining to the HAB and recidivism is needed in correctional and psychiatric populations.

1.9. Changes in HAB over Time

As mentioned above, the HAB has been found to be a risk factor for violence, re-offending, and other harmful outcomes. To determine whether the HAB is a dynamic risk factor, studies must examine its behaviour over time as well as the extent to which changes in HAB are related to outcomes. A small number of studies has examined whether the HAB is stable, fluctuates over time, or whether it decreases through intervention. For example, one study of workplace aggression found that a new scale measuring hostile attributions had good test-retest reliability (r = .80) over a two to three week period despite having low internal consistency (α = .60) (Homant & Kennedy, 2003). Further, Coccaro, Noblett, and McCloskey (2009) demonstrated that the HAB significantly decreased over time and had good test-retest reliability (r = .75) over an eight to ten month period in a sample of healthy adults and impulsive aggressive patients.

In a study using the External Hostile Attributions Scale (EHAS; McNiel, Eisner, & Binder, 2003) in a civil psychiatric sample, Hendry (2009) demonstrated that EHAS

scores decreased significantly over a four to six week period after discharge from hospital. Further, using Generalizability Theory, Hendry and Douglas (2010) parsed out the variance components attributed to time and change in item scores over a four to six week period rather than examine changes in total scores. The authors found that the EHAS had good test-retest reliability (*G* coefficient = .78), and that little variance in the analyses were due to the effects of time or participants. Rather, most variance was attributable to changes in item scores across time and participants, as well as variance in the rank ordering of participants across time. Thus, these results suggest that the EHAS does change over time, and that this change may be attributable to changes in participants' item scores over time.

A few studies have also demonstrated that the HAB shows a decrease over time as a result of intervention. Similar to the research on hostile attributions and aggression, most research on interventions related to the HAB has been conducted on children. In one study, 108 aggressive and nonaggressive African-American boys were randomly assigned to three groups: an attributional intervention group, an attention training group, and a "no treatment" control group. The focus of the attributional intervention was to teach boys how to detect intentionality, how to make attributions of nonhostile intent, as well as how to link appropriate behavioural responses to situations. Boys in the attention training group, on the other hand, received an intervention aimed at teaching nonsocial problem solving skills, such as following directions (Hudley & Graham, 1993).

Hudley and Graham found that, compared to the control and attention training groups, aggressive boys in the attributional intervention group showed a significant decrease in presuming hostile intent as well as a preference for aggressive behaviour in scenarios with ambiguous intent. The results also showed that aggressive boys in the attributional intervention group were rated as less aggressive by their teachers after the intervention, despite the teachers remaining blind to group assignment. However, the "real world" behavioural outcome (i.e., being sent to the principal's office), was not affected by the intervention in that three months after the intervention, boys in the attributional intervention group were as likely to be referred to the office as prior to the start of the intervention (Hudley & Graham, 1993). Despite these results, this intervention demonstrated that a decrease in HAB can be achieved and is noticeable to teachers blind to group assignment.

In a sample of 384 African-American and Latino third through sixth graders, Hudley and colleagues (1998) assigned boys to one of three groups discussed above (also see Hudley & Graham, 1993, for details). Results demonstrated that changes in self-control, as rated by teachers, showed the greatest change in the attributional intervention group, and that the improvements attributable to the intervention were maintained over a 21-month period. Boys in the attributional intervention group also showed a significant improvement in judgments of hostile intent, although these changes were not maintained over time (Hudley et al., 1998). Thus, this study again demonstrates the importance of incorporating the HAB in intervention programs, though the program had a high attrition rate (32%), and its generalizability may be limited to Latino and African American boys.

A recent study by Keil, Paley, Frankel, and O'Connor (2010) examined the effectiveness of an intervention on hostile attributions in a sample of 100 children with prenatal alcohol exposure (PAE), given that PAE is associated with a number of developmental deficits, including social skills and social information-processing. Children were between the ages of six and 12, and were randomly assigned to one of two groups: a social skills intervention (Children's Friendship Training group; CFT) or a Delayed Control Treatment (DCT) condition. Although there was no significant effects in provocative scenarios, children in the CFT group showed a significant decrease in hostile attributions with respect to peer group entry scenarios compared to the DCT condition, and these gains were maintained at the 3-month follow-up period. In addition, once the DCT condition received the intervention, the same pattern of results was found (Keil et al., 2010). This study demonstrates that the effects of this intervention were domain-specific, and that gains were maintained over time (albeit a short period of time).

One study has examined the effects of an intervention on the HAB in adults. Using the Hostile Interpretations Questionnaire (HIQ) in a sample of 47 mentally ill offenders undergoing generic correctional programming aimed at modifying offenders' cognitions (e.g., decision-making skills, problem solving, ways of thinking rationally), Ashford, Wong, and Sternbach (2008) found that scores on the HIQ, as well as on its specific scale devoted to attributions of hostility, showed a significant decrease from pre- to post-intervention. Importantly, although there was no difference in the actual arrest rates, this change in hostile attributions was related to a significant decrease in the

number of technical probation violations over a 12-month follow-up (Ashford et al., 2008).

The study, however, suffered from a number of limitations, including a lack of random assignment of participants and a high attrition rate for the correctional programming group (48%). In addition, although they included a “Treatment As Usual” (TAU) group in their study, the authors did not report whether their findings apply to both groups (i.e., correctional programming or TAU), or whether they are exclusive to correctional programming. Despite these caveats, the results underscore the promising nature of the HAB in psychiatric and correctional settings and suggest that the HAB is a potentially valuable and meaningful construct to take into consideration when considering the risk for violence and re-offending.

1.10. Predicting Who Changes

A new area of study within dynamic risk factors in longitudinal studies is the examination of the nature of the change, as this has important implications for risk management planning. While informative, knowing whether clients’ or patients’ level of HAB changes can be limited without knowledge of what is driving the change, and how the practitioner can assist. As such, it is important to conduct studies aiming to forecast changeability among dynamic risk factors.

Two variables stand out when thinking about barriers for the HAB to change over time; namely, psychopathy and treatment non-compliance. Traditionally, the term ‘psychopath’ has been used to refer to individuals who view the world as an unpredictable and hostile place, and the hostile distortions endorsed by psychopaths have been thought to be contributory factors in their antisocial behaviours (Cleckley, 1976; Newman & Wallace, 1993; Serin & Kuriychuk, 1994). Psychopathy is considered by many to be a personality disorder and, as such, psychopathic traits, including hostile distortions, could be considered stable. Therefore, it stands to reason that higher levels of psychopathy would be related to stable HAB scores over time.

Although very little research has addressed this issue, one recent study mentioned above (Douglas et al., 2011) found that psychopathy scores varied

significantly across participants with different trajectories on the Clinical Scale of the HCR-20, such that patients with lower C scores had lower psychopathy scores, and those with higher C scores were higher on psychopathy.

Another relevant variable to consider in forecasting whether the HAB may increase, decrease, or remain unchanged over time is the level with which participants engage in treatment; that is, the extent to which they comply with medications and appointments with mental health practitioners. Researchers have estimated that as many as 50% of individuals with chronic medical and mental disorders do not receive the full benefit of their treatment due to non-compliance (Herbeck, Fitek, Svikis, Montoya, Marcus, & West, 2005). Treatment non-compliance has been identified as one of the most important factors which limits the rate of recovery in individuals with mental illness (Bourgeois, 2005) as well as offenders (McMurran, Huband, & Overton, 2010) and, in fact, medication non-compliance is considered the "most significant reason for failed therapy" (Robbins, 1980, p. 709). Based on these findings, as well as the findings that the HAB has been found to decrease from pre- to post-intervention (Ashford et al., 2008), it would be expected that individuals who do not comply with treatment would not show a decrease in HAB over time, given the potential decreased effectiveness of the intervention.

1.11. Purpose of the Present Study

The main goal of this study was to examine, in a sample of civil psychiatric patients and criminal offenders, whether the HAB, as measured by the External Hostile Attributions Scale (McNiel, Eisner, & Binder, 2003), can be established to be a dynamic risk factor with respect to recidivism and violence. In this respect, the objectives of the study were to examine whether the EHAS is predictive of violence and recidivism, to examine whether and how much the EHAS fluctuates over time, and whether change in EHAS scores over time is predictive of outcomes. I also sought to determine whether some participants exhibit different trajectories of change over time. Lastly, if the EHAS was found to change over time, I aimed to forecast which individuals show changes on the EHAS by using psychopathy and treatment non-compliance variables as predictors.

Based on the extant literature, I address the following research questions and propose these hypotheses:

1. Are scores on the EHAS predictive of violence and recidivism? It is hypothesized that the EHAS will be a significant predictor of violence and recidivism, prospectively. This was examined both over the short-term (i.e., 4-6 weeks) and long-term (i.e., 8 weeks or longer).
2. Do EHAS scores change over time? It is predicted that EHAS scores will show change over time, and that overall EHAS scores will show a significant decrease over time. This was examined in both subsamples separately, to examine whether the EHAS' functioning is generalizable to both populations.
3. Is the degree of change over time on the EHAS related to violence and recidivism? It is predicted that the extent of change in EHAS scores over time will be a significant predictor of violence and recidivism.
4. Are scores on the EHAS associated with the amount of time until violence or recidivism? It is predicted that individuals with higher EHAS scores will have a violent incident and recidivate sooner than individuals with lower EHAS scores.
5. Are there groups of individuals who show the same pattern of changes in EHAS scores over time and, if so, do these groups have different rates of violence and recidivism? It is expected that individuals will show different patterns of change over time, and that recidivism and violence will differ based on these groups.
6. Can change be predicted by other, potentially relevant variables such as psychopathy and treatment non-compliance? In other words, would it be possible to predict which participants would show changeability in EHAS scores over time? It is predicted that psychopathy and treatment non-compliance would be associated with groups of individuals showing either a lack of change or an increase in EHAS scores over time.

2. Method

2.1. Overview

This study was part of larger prospective, repeated-measure research project examining the relationship between dynamic risk factors and multiple adverse outcomes in psychiatric patients and provincial offenders (the latter with and without mental illness). Semi-structured interviews and self-report measures were completed to examine, *inter alia*, how much risk factors change over time as well as their relationships with violence and recidivism, with the goal of reducing adverse outcomes in these populations. Ethical approval for the current and larger project was obtained from the Simon Fraser University Research Ethics Board, the University of British Columbia, the Ministry of Public Safety and Solicitor General, Corrections Branch and the Fraser Health Authority, a government organization responsible for healthcare in the Fraser North, South, and East regions of the Lower Mainland of British Columbia.

2.2. Participants

A total of 207 participants were recruited from two different samples: civil psychiatric patients, and criminal offenders serving a custodial or community sentence in the province of British Columbia. Offenders who were on probation or incarcerated were included in the criminal sample because they had committed a crime. Civil psychiatric patients and incarcerated offenders were nearing discharge/release into the community from their respective institutions.

2.2.1. Sample 1: Civil Psychiatric Patients

A total of 133 civil psychiatric patients admitted voluntarily or involuntarily were recruited from the psychiatric ward of Royal Columbian Hospital (RCH) in New

Westminster, British Columbia. The HAB measure of interest was completed by 118 participants and, as such, only these participants were retained for analysis (see *Informed Consent*).

Participants' (63 male, 55 female) ages ranged from 19 to 61 years (*M* = 34.14, *SD* = 10.40), and had an average of 12.72 (*SD* = 2.29) years of education (range, 7 to 21). Most participants self-identified as Caucasian (79%), followed by Asian (11%), Other (7%), and Aboriginal (3%). The majority of participants (61%) were single (not married and not common-law), 15% were divorced, and 12% were either married or common-law. At the time of admission, 65% of participants were unemployed.

Approximately three quarters (75%) of participants were admitted involuntarily. Reasons for admission included concerns regarding harm to self (78%), risk of psychiatric deterioration (66%), and concerns regarding harm to others (18%). Most common recent Axis I diagnoses, according to participants' hospital charts, were Psychotic Disorder or Schizophrenia (36%), Bipolar Disorder (28%), Major Depressive Disorder (26%), and Substance or Alcohol-related Disorder (3%). The majority of participants (55%) reported a history of violence as an adult. History of violence was defined as any violence perpetrated by the participant as an adult (age 15 and over) prior to the baseline interview. Violence consisted of acts such as fighting, pushing, shoving, biting, threatening behaviour with or without a weapon in hand, assault, robbery, and sexual assault. According to the *Corrections Network* (CORNET), the British Columbia electronic offender management system database, a minority of participants (12%) had been formally charged or convicted of a criminal offence, whereas a slightly higher proportion (14%) of participants self-reported having been arrested, charged, or convicted of a crime. A total of 16 participants (14%) had either documented or self-reported involvement in the criminal justice system. Data for this variable were missing for 7 participants.

2.2.2. Sample 2: Provincial Offenders

A total of 74 provincial offenders were recruited from four correctional institutions and four community probation offices in the Lower Mainland of British Columbia: Fraser Regional Correctional Centre, North Fraser Pretrial Centre, Surrey Pretrial Services

Centre, Alouette Correctional Centre for Women, Burnaby Community Corrections, Abbotsford Community Corrections, Tri-Cities Community Corrections, and Vancouver Intensive Supervision Unit. To be incarcerated in a British Columbia provincial jail, individuals must have been sentenced for a 'two years less a day' term or less. The HAB measure of interest was completed by 56 participants and, as such, only these participants were retained for analysis (see *Informed Consent*).

Participants' (28 male, 28 female) ages ranged from 20 to 54 years (M = 33.48, SD = 8.48), and had an average of 11.07 (SD = 2.12) years of education (range, 6 to 18). Most participants self-identified as Caucasian (77%), followed by Aboriginal (16%), East Indian (4%), and Other (4%). The majority of participants (66%) were single (never married or never common-law), 14% were either married or common-law, and 10% were divorced. At the time of sentencing, 70% of participants were unemployed.

Most common recent Axis I diagnoses on file were Major Depressive Disorder (7%), Bipolar Disorder (5%), and Anxiety Disorder (4%). Mental health screening done by the Research Assistants (RAs) using the Structured Clinical Interview for DSM-IV (SCID-I; First, Spitzer, Gibbon, Williams, & Benjamin, 1997) showed that 57% of participants had a major mental illness (i.e., mood or psychotic disorder) at some point in their lifetime.

The majority of participants (88%) reported having been violent as an adult. Similarly, most participants (80%) reported having had prior contact with the criminal justice system (i.e., arrest, charge, or conviction prior to the index offence), whereas 39.3% of participants admitted to having been arrested, charged, or convicted of a violent offence prior to the index offence. The most common index offences consisted of property crimes (e.g., Theft Under $5000, Breaking and Entering, Fraud), crimes against persons (e.g., Assault, Assault with a Weapon, Robbery), drug offences (e.g., Possession of Substances, Possession for the Purpose of Trafficking), other Crimes against Persons (e.g., Uttering Threats), and minor crimes or court-related offences (e.g., Probation Violation, Failure to Appear). At the time of recruitment, 64% of participants were incarcerated, and the remainder of individuals (36%) was recruited while on probation. Due to the small sample size of the criminal sample, both offenders who were incarcerated and those on probation were included together in the analyses.

2.3. Procedure

2.3.1. Recruitment

Psychiatrists at RCH provided RAs with names of individuals nearing discharge from hospital, and these participants were approached by an RA to participate in the study. Participants were eligible to participate in this study if they (a) were between the ages of 18 and 50 years[1], (b) could speak English, and (c) resided in the catchment area covered by the Fraser Health Authority. Participants who were unable to provide informed consent (see *Informed Consent*) or had a chart diagnosis of mental retardation were excluded from this study.

Recruitment for the offender sample was done in a similar fashion. Offenders were selected based on eligibility criteria by the different correctional sites' staff members, who provided RAs with a list of potential participants. The RAs then chose at random which offender to approach. Eligibility criteria were similar to those for the civil sample, with the additional criteria that offenders must have been serving a custodial sentence of at least 30 days to be included in the study, or have been on probation for six months. Further, all participants had to have at least a 6-month probation order following the baseline interview. These additional requirements were to ensure that RAs had enough information to adequately complete and code instruments and measures, which required file review, and were able to get in touch with participants during the follow-up periods.

2.3.2. Informed Consent

All participants needed to provide informed consent in order to take part in the study. In both settings, RAs went through the consent form with the participants. The consent form explained the purpose and procedures of the study, the voluntary and confidential nature of the research project, the limits to confidentiality, and that study

[1] The intention was to recruit individuals between 19 and 50 years of age only. However, in absence of individuals in this age range, some individuals (n = 5) were recruited despite being over 50 years of age.

participation, refusal, or withdrawal would not affect the standing of the participant (e.g., treatment opportunities, probation, quality of care) either at RCH, at the correctional institution, or in the community following discharge or release. Participants were asked to answer five multiple-choice questions as well as five questions requiring a short answer to ensure their understanding of the material in the consent form. Information related to any question answered incorrectly was reviewed by the RA, and the question was asked again. Participants needed to answer all ten questions correctly to be considered as having given informed consent.

Before each phase of the study (i.e., screening, self-report, interview, follow-up), participants were reminded of the main points included in the informed consent (i.e., participation is voluntary, confidential, and does not affect their standing within the hospital/correctional site or subsequent treatment opportunities and privileges).

Over the course of the study, of the 490 civil psychiatric patients who were asked if they were willing to hear about the study, 64 (13%) declined, and 426 (87%) agreed to RAs approaching them; however, 53 (12%) individuals were discharged before completing informed consent. A total of 373 patients completed the informed consent procedure. Of these, 169 (45%) declined participation in the research project; 174 (47%) agreed to participate, and 30 (8%) agreed to participate but were either found not to be competent to participate as they could not accurately answer the questions after reviewing the consent form with the RAs, or found unsuitable to go forward by RAs (e.g., actively psychotic, was moving away from Lower Mainland upon discharge). The refusal rate in this subsample is higher than that of a comparable multi-wave study (i.e., MacArthur Study of Mental Disorder and Violence; Steadman et al., 1998), in which 29% to 33% (depending on the site) of participants refused to participate.

Of the 174 participants who agreed to take part in the study and were competent, 133 (76%) had full or partial data for the baseline protocol, meaning that they had completed at least the interview and/or self-report session. Of these, 118 (68%) had completed the self-report session; as such, only 118 participants had completed the measure of interest and were retained for analyses.

In the correctional sample, 101 offenders were approached about participating in the study, and only one person (1%) declined to hear about the study. Three individuals (3%) were released before completing informed consent and could not be located. A total of 97 individuals completed the informed consent procedure, and 87 (90%) agreed to participate in the study. Of the 10 (10%) individuals who did not participate, six individuals declined to participate, and four individuals were either deemed incompetent to proceed or unsuitable to participate in the study. This refusal rate is lower than that of the civil psychiatric patients as well as the community sample recruited in Steadman et al. (1998), in which 52% of eligible individuals refused to participate. Of the 87 participants, 74 (85%) had full or partial data for the baseline protocol, but only 56 (64%) had completed the self-report session, and therefore 56 individuals were retained for analyses, having completed the measure of interest.

2.3.3. Baseline Phase

After providing informed consent, a diagnostic screen was used for the correctional sample only (see *Measures*). This screen informed us as to which offenders are mentally disordered and which are not. This screening process took, on average, 30 minutes, and participants were compensated $5 for their participation.

At baseline, participants in both samples completed a self-report session consisting of a number of questionnaires assessing different dynamic risk factors, such as substance use, psychiatric symptoms, criminal attitudes, and stress. This session lasted approximately an hour and a half, and participants were compensated $10 for participating in this part of the study.

Graduate-level RAs administered the baseline interview protocol, which inquired about participants' background, current psychiatric symptoms, personality, experiences, and plans for the future, and was also used to code certain risk assessment instruments (see *Measures*). This semi-structured interview took an average of 3 hours to complete, and participants were compensated $10 for their involvement in this phase of the project.

Both the interview and self-report session were completed while individuals were incarcerated or hospitalized, if possible. In the event that participants were released or

discharged before having completed all phases of the baseline protocol, or were on probation at the start of their involvement in the study, data collection was completed at safe public locations (e.g., Starbucks coffee shops) chosen by the participant and RA or at one of the outpatient clinics, correctional facilities (e.g., probation offices), halfway houses or independent living facilities who offered us office space to facilitate data collection. A maximum of two weeks in between the self-report and the interview was considered optimal, to ensure accuracy of information as well as correspondence between self-report and interview sessions.

2.3.4. Follow-up Phase

A total of five follow-up assessments were conducted after the baseline phase. Follow-up assessments were conducted in the community four to six weeks after the baseline interview in mental health clinics, probation offices, or other public locations. For this phase, participants completed the same self-report measures of putatively dynamic risk factors as they did at baseline, and RAs conducted a semi-structured interview asking about different areas of functioning since their last meeting. Participants were remunerated $20 for their involvement with in the follow-up phase and, if they completed all five follow-ups, they received an extra $20.

Civil psychiatric patients' and criminal offenders' files were reviewed, either at RCH or using the BC Corrections electronic file review system, the Corrections Network System (CORNET), respectively. File information (e.g., discharge summaries, nursing notes) was used to add to the information given by the participants during the self-report and interview components of the study, as well as to rate some rater-based measures used for the larger study. CORNET was also used to collect data pertaining to official charges and convictions in both samples.

2.4. Measures

2.4.1. External Hostile Attributions Scale (EHAS; McNiel et al., 2003)

The EHAS is a 20-item self-report questionnaire designed to measure aggressive attributional style and external hostile attributions. Participants rate the degree to which they believe each statement on a 4-point scale (1 = Do not believe at all, 4 = Completely believe). Research on the EHAS has shown that it has good internal consistency in civil psychiatric patients (αs = .80 to .84) (Hendry, Michal, & Douglas, 2010; McNiel et al., 2003), and adequate internal consistency in undergraduate students (α = .67; Hendry et al., 2010)[2]. Moreover, in civil psychiatric patients the EHAS has been shown to have good construct validity with respect to its association with persecutory delusions, criminal attitudes, and a measure of thinking disorder (Hendry et al., 2010).

Hendry (2009) suggested that the items on the EHAS may actually tap two different constructs, and therefore created two scales based on conceptual dissimilarities between items: Scale 1 consisted of items which appeared to measure *Persecutory Delusions* (12 items), and Scale 2 consisted of items pertaining to *Attitudes toward Violence* (8 items). The psychometric properties and convergent validity of these scales in a civil psychiatric sample were then reported. Results demonstrated that Scale 1 had good internal consistency (α = .89) and correlated highly with Total EHAS scores (r = .93, p < .001), whereas the internal consistency of Scale 2 was poor (α = .51), with a strong correlation with Total EHAS scores (r = .51, p < .001).

With respect to the two scales' convergent validities, results were mostly positive. Scale 1 (Persecutory Delusions) was significantly associated with measures of thought disorder, presence of delusions, and treatment non-compliance. Scale 2 (Attitudes toward Violence) was not found to have a significant correlation with conceptually related variables, such as criminal attitudes, violence risk, and psychopathy; however, this was interpreted to likely be due to the low internal consistency of the scale (Hendry, 2009).

Given the preliminary findings which suggest that the EHAS taps two constructs, and due to the exploratory nature of this research project in determining whether the EHAS can be a dynamic measure of hostile attributions, both Scale 1 and Scale 2 were examined, as the dissimilarities in items on both scales could influence changes in scores over time to a larger extent than the total scales could. Specifically, it is useful to determine which (if not both) scales could be amenable to intervention, as demonstrated by changes in scores over time.

Psychometric properties for the EHAS in the current study are presented in the *Results* section. In this study, EHAS scores at baseline as well as the first and second follow-up were used for analyses examining change of EHAS scores over time, as well as whether change in EHAS scores over time is predictive of adverse outcomes.

2.4.2. Structured Clinical Interview for the DSM-IV – Axis I Disorders Research Version (SCID-I RV; First, Spitzer, Gibbon, Williams, & Benjamin, 1997)

The SCID-I is a semi-structured interview assessing symptoms indicative of Axis I symptomatology and DSM-IV diagnosis. In the present study, the psychotic and mood disorders modules of the SCID-I were used. The SCID items are rated a 3-point scale, where ‘1’ indicates that the symptom is absent or false, ‘2’ indicating the subthreshold nature of the symptom, meaning that the individual almost meets the criterion but not severely enough, and ‘3’ referring to the threshold being definitely met and the trait causing significant impairment or distress in the individual. The purpose of using the SCID-I was to screen for mental illness and classify the offenders as having a diagnosis or no diagnosis. The many studies having been conducted using the SCID-I have established excellent psychometric properties for this measure (First et al., 1997; Rogers, 2001).

2.4.3. State-Trait Anger Expression Inventory -2 (STAXI-2; Spielberger, 1999)

The STAXI-2 is a three-part, 47-item self-report measure used to identify state anger (15 items), trait anger (10 items), and anger expression (22 items). The trait anger subscale was used in this sample to aid in imputing EHAS data[3], as it has been shown to be significantly associated with the EHAS in civil psychiatric patients (r = .20, p < .05) as well as criminal offenders (r = .64, p < .01) in previous research using this sample (Hendry & Douglas, 2012). The STAXI-2 trait anger subscale demonstrated good internal consistency in this study, in both samples (i.e., α = .87 and α = .89 for psychiatric patients and criminal offenders, respectively).

2.4.4. Brief Psychiatric Rating Scale – Expanded Version (BPRS-E; Lukof, Nuechterlein, & Ventura, 1986)

The BPRS-E comprises 24 behaviorally anchored items based on individual self-report and interviewer ratings which measure the severity of psychiatric symptoms of a 7-point scale. The BPRS-E has been used extensively in psychiatric settings (e.g., Dingemans, Linszen, Lenior, & Smeets, 1995). In this study, the Thought Disorder factor of the 5-factor model (see Burger, Calsyn, Morse, Klinkenberg, & Trusty, 1997), comprised of 4 items (Hallucinations, Grandiosity, Unusual Thought Content, and Conceptual Disorganization), was used to aid in imputing the EHAS data for the civil sample only, as it has been shown to have a significant association with the EHAS (r = .33, p < .01) in a previous study using this sample (Hendry & Douglas, 2012). In this sample, the Thought Disorder factor of the BPRS had a poor internal consistency (α = .53), but had excellent inter-rater reliability (ICC_1= .98).

2.4.5. Criminal Sentiments Scale – Modified (CSS-M; Shields & Simourd, 1991)

The CSS-M is a 41-item scale measuring attitudes toward the law, courts, police, as well as whether individuals associate with others involved in crime and whether they

[3] Details about the rationale and steps taken for imputation are discussed in the Missing Data section.

have tolerance for law violations. Items are rated on a 3-point scale indicating how much participants agree with the statements (i.e., Disagree, Agree, or Undecided). The CSS-M has been studied in both civil psychiatric patients and correctional samples (e.g., Reeves, Hendry, & Douglas, 2011; Simourd, 1997; Simourd & van de Ven, 1997), and has demonstrated adequate internal consistency (α = .73 to .92), in these samples. In addition, it has been found to be significantly associated with the EHAS in civil patients (r = .30, p < .01) and offenders (r = .71, p < .01) using this sample (Hendry & Douglas, 2012). In this study, the CSS-M was used to aid in imputing EHAS scores and had excellent internal consistency in both psychiatric patients (α = .92) and offenders (α = .92)

2.4.6. Psychopathic Personality Inventory – Revised (PPI-R; Liliendeld & Widows, 2005)

The PPI-R is a 154-item self-report measure designed to measure psychopathic personality traits. Participants are asked to answer each item on a 4-point scale (i.e., “False”, “Mostly False”, “Mostly True”, “True”). It has been widely used in correctional and forensic samples, and has good convergent validity with other measures of psychopathy, personality, and psychiatric symptoms (e.g., Edens & McDermott, 2010; Nikolova, 2009; Witt, Donnellan, Blonigen, Kruger, & Conger, 2009). The PPI-R has three validity scales, Virtuous Responding, Deviant Responding, and Inconsistent Responding), which are meant to identify individuals who are involved in positive impression management (i.e., “faking good”), negative impression management (i.e., “faking bad”), and inconsistent responding (i.e., answering similar questions with different responses), respectively (Lilienfeld & Widows, 2005).

In this study, the PPI-R was administered to the correctional sample in an effort to identify participants who may have invalid profiles. Recent research suggests that the Inconsistent Responding-40 scale (IR40), which is the more stringent of the Inconsistent Responding scales, is most often used to determine the validity of individual profiles (Gummelt, 2010; Nikolova, 2009).

2.4.7. Previous Adult Violence

This dichotomous variable was created based on baseline self-report information and CORNET review for each individual. Participants were asked whether they had ever engaged in a violent act in adulthood, defined 15 years or older (e.g., robbing someone, forcing sexual intercourse, hitting someone). In addition, the *MacArthur Violence Interview* was used. Any CORNET charge or conviction for violent crime was also considered violent. This variable was used to determine the base rate of previous violence in both samples. Further, it was used as a predictor of follow-up violence and recidivism in multiple imputation analyses, to impute data for these outcomes when the latter were missing.

2.4.8. Previous Arrest, Charge, or Conviction

Participants were asked whether they had ever been arrested, charged, or convicted of a crime prior to the baseline interview and index conviction (for participants in the criminal sample). Both self-reported information and CORNET data were combined into this variable, which was coded dichotomously. Again, this variable was used to determine baseline characteristics of the sample, and was used as a predictor of follow-up violence and recidivism in multiple imputation analyses, to impute data for these outcomes when the latter were missing.

2.4.9. Prior and Current Admission Treatment Checklist

This section of the interview sought to determine whether participants have been non-compliant with treatment during follow-up periods. More specifically, participants were asked whether they had participated in one (or more) of 11 specific types of treatment (e.g., medication, individual or group therapy, substance abuse program), and whether there had been instances of non-compliance during the follow-up period, such as not taking medication according to doctor's orders, or stopping going to treatment if it did not end naturally. For the civil sample, this was coded as present if participants stopped going to or did not participate as suggested by a mental health professional for any of the treatments listed during each time period. Non-compliance was coded in the same way for the correctional sample; in addition, non-compliance with their community

supervision order (e.g., consumption of alcohol, not reporting to probation officer, committing a new crime) was also coded as “non-compliance with treatment” in this sample.

Overall, all but one participant for whom data were available was involved in some type of treatment and/or community supervision during the follow-up period (data were missing for seven participants). In participants for whom data were available, the breakdown was as follows:

In the civil psychiatric sample, all participants[4] (100%) reported being involved in at least one type of treatment at baseline. Similarly, the majority of participants were engaged in one of more types of treatment at the first follow-up (99%) as well as at the second follow-up (99%). At baseline, all participants (100%) reported taking medication for their mental health condition. In addition, 39% of participants were involved in individual therapy, 56% were involved in group therapy, 19% were involved in either a drug or alcohol program, and 2% were involved in a vocational program (these percentages add up to greater than 100% due to the involvement of most individuals in more than only one type of treatment).

With respect to the first follow-up, of the 87 (99%) participants involved in treatment, most (87%) reported taking medication for their mental illness, 7% reported receiving only therapy, and 5% reported receiving a combination of therapy and medication. These percentages were similar for follow-up 2.

In the correctional sample, 44 (79%) participants reported being involved in at least one type of treatment at baseline (i.e., either in an institution or on probation), while 31 (84%) participants reported being engaged in treatment at the first follow-up, and 18 (90%) were involved in treatment at the second follow-up. However, all participants were involved in community supervision at both follow-ups, as this was a condition for inclusion in the study.

[4] Detailed information on attrition of participants is presented in the *Missing Data* section.

In addition to court-ordered supervision, at baseline, 38% of individuals in the criminal sample reported taking medication for mental health problems, 30% reported being involved in individual therapy, 10% were involved in group therapy, 30% were involved in an alcohol program, 41% were involved in a drug program, and 29% reported being involved in other correctional programming (e.g., Respectful Relationships). At the first follow-up, 40% of participants were taking medication for mental health problems, 10% were engaged in individual therapy, 13% were attending in a drug or alcohol program, and 33% were involved in other correctional programming. These percentages were similar for the second follow-up.

2.4.10. Psychopathy Checklist – Screening Version (PCL-SV; Hart, Cox, & Hare, 1995).

The PCL:SV was used as a measure of psychopathy in the civil sample. It was developed for use as a short screening measure for psychopathy in forensic and civil psychiatric patients. Items are scored on 3-point scale (0 = does not apply, 1 = applies to a certain extent, 2 = applies), and total scores range from 0 to 24. Studies having used the PCL:SV with civil psychiatric patients have demonstrated a moderate to large association with violence (e.g., Douglas, Ogloff, Nicholls, & Grant, 1999; Monahan et al., 2001). In this sample, α was .84, and inter-rater reliability was good (ICC_1 = .81). PCL:SV scores were converted to *z*-scores, to have a common metric in analyses using both the civil (i.e., PCL:SV) and criminal samples (i.e., PCL-R).

2.4.11. Psychopathy Checklist – Revised (PCL-R; Hare, 1991, 2003).

The PCL-R was used as the measure of psychopathy in the criminal sample. It is a 20-item measure developed to assess psychopathy in correctional populations. Each item is rated 0 (Does not apply), 1 (Applies to a certain extent), or 2 (Applies). Scores range from 0 to 40 and are based on the integration of interview and file information. Research supports the use of the PCL-R in terms of its utility in predicting aggressive behavior (Hare, 1991; 2003). In this study, α was .77. Inter-rater data for the PCL-R was not available in this sample; however, previous research (e.g., Rufino, Boccaccini, & Guy, 2011; Hare, 1991/2003) has demonstrated good inter-rater reliability (*ICC* = .86 to

.94) in male and female offenders. PCL-R scores were converted to *z*-scores, to have a common metric in analyses using both the civil (i.e., PCL:SV) and criminal samples (i.e., PCL-R).

2.5. Outcomes

2.5.1. Recidivism

In both samples, recidivism was coded dichotomously based on the presence or absence of any crime committed after the baseline interview, and included violent and non-violent offences as well as breaches. Combined information from official and self-report sources was considered. Specifically, for the purpose of this project RAs reviewed participants' criminal records on CORNET, BC's electronic offender management system, to determine whether they had been charged or convicted of a crime following the start of their involvement in the study. In addition, during each follow-up interview, participants were asked whether they had engaged in any criminal activity (i.e., arrest, charge or conviction), as well as any activity that would be considered a crime if they had been caught (i.e., "Since we last met, have you engaged in any crime, even if you have not been caught?"). The formal and self-reported information was combined and this variable was coded as absent or present. It is acknowledged that recidivism is at times used to refer only to formal contact with the police; however, for simplicity, the term "recidivism" here was used to refer to any formal or self-reported contact with the criminal justice system.

2.5.2. Serious Recidivism

In both samples, serious recidivism was coded using the same variables as the *Recidivism* variables (i.e., arrests and convictions according to CORNET and self-reported criminal activity). However, "serious" was defined as any offense against other individuals, such as assault, uttering threats, sexual offences, and robbery. This variable was coded dichotomously based on the presence or absence of formally documented serious offences and/or self-reported serious offences at any time after the baseline interview.

2.5.3. Violence

Violence variables were created using a number of different sources of information. First, at each follow-up interview, the *MacArthur Violence Interview* (Monahan et al., 2001) was administered to participants to assess whether they had engaged in any of eight aggressive behaviours during the follow-up period of interest (e.g., biting, kicking, forced someone to have sex against their will, threats made with a weapon in hand), even if not caught by police. Second, participants were asked supplementary violence questions (i.e., Other Aggressive Acts; Monahan et al., 2001) as well as questions derived to be consistent with the HCR-20's definition of violence (Webster et al., 2001) to determine whether they had engaged in any violent or aggressive acts of a less severe nature (i.e., threats without a weapon in hand, yelling so as to have possibly frightened others). Third, the hospital chart of patients who had been re-admitted to RCH after the baseline interview but before October 2011 were reviewed and coded for the presence or absence of violence during re-admissions. Lastly, CORNET was used to determine whether participants had been charged or convicted of a violent crime during the follow-up period of interest. In the event that the participant was lost before what would have been the end of the study for that particular individual (i.e., at the fifth follow-up), a tentative completion date was computed (e.g., five months after the baseline interview, for someone who had been lost after the baseline interview), and CORNET information was reviewed to determine whether a potential violent charge or conviction had occurred, and which follow-up period this violent incident would have occurred in.

These data were incorporated into the dichotomous ratings of violence for each time point. This resulted in a variable measuring violence at three different time points:

Violence at Follow-Up 1

Information from the first follow-up interview was used to determine whether the participant had been violent between the baseline interview and the first follow-up (i.e., usually four to six weeks following the baseline interview). Violence was coded as present or absent based on the following sources of information: having been charged or convicted of a violent offence between baseline and follow-up 1 (as per CORNET), having file information indicate that they had been violent, or having endorsed any of the

violence-related *MacArthur Violence Interview* and *Other Aggressive Acts* questions asked during the first follow-up interview. This dichotomous variable was used to determine the predictive validity of the EHAS over the short-term.

Violence at Follow-Up 2

This variable was coded in the same way as the *Violence at Follow-Up 1* variable, but was based on a different time period. For this variable, information from the second follow-up interview was used to determine whether the participant had been violent between the first and second follow-ups (i.e., in the four to six weeks after the first follow-up). Violence was coded as present or absent based on the following sources of information: having been charged or convicted of a violent offence between the first and second follow-ups (using CORNET), having file information indicate that they had been violent, or having endorsed any of the violence-related questions asked during the second follow-up interview. This dichotomous variable was used to determine the predictive validity of the EHAS over the short-term.

Violence at Any Follow-Up

This variable was coded in the same way as the two previous variables, but was based on a different, longer time period. For this variable, information from all of the follow-ups was used to determine whether the participant had been violent between the baseline interview and the end of their involvement in the larger study (e.g., at follow-up 5, if participants completed all follow-ups). Violence was coded as present or absent based on the following sources of information: having been charged or convicted of a violent offence (using CORNET) after the baseline interview but before the end of their involvement in the study, having file information indicate that they had been violent, or endorsing any of the violence-related questions asked during the any of the follow-up interviews. This dichotomous variable was used to determine the predictive validity of the EHAS over the long-term.

2.6. Statistical Analyses

Descriptive statistics were examined for the entire sample. Age, gender, and ethnicity of the samples were compared using Chi-square statistics (χ^2), and, for

continuous variables, independent samples *t*-tests were used to determine if scores on the EHAS were significantly different on any of the demographic variables. Basic psychometric properties of the EHAS were computed for each sample and time point. When appropriate, analyses were conducted separately both each sample to examine whether the results were generalizable to both populations.

Logistic regression analyses were used to examine the predictive validity of the EHAS vis-à-vis violence and recidivism, and hierarchical logistic regression was used to control for potential covariates in the relationship between the EHAS and outcomes. Logistic regression was chosen for its ability to predict dichotomous outcomes (Cohen, Cohen, West, & Aiken, 2003).

To examine the relationship between EHAS scores and time until recidivism, Cox Proportional Hazard Analysis was used. This technique is specifically designed for analysis of duration data, making it appropriate to study a variety of time-related outcomes, such as time from baseline interview to contact with the criminal justice system. Hazard Analysis measures time to the occurrence of an event (e.g., recidivism) for a group of individuals (Luke & Homan, 1998; Tabachnick & Fidell, 2001). Analyses were conducted using baseline EHAS scores (Total and Scales 1 and 2) as well as *changes* in EHAS scores over time, with violence, recidivism, and serious recidivism as outcomes.

Time at risk, or the time between baseline self-report session and violence or contact with the criminal justice system, was measured in days. RAs coded the date of the baseline self-report session and, using CORNET, recorded the date of any subsequent recidivism. “Censored survival times” were used as it was possible that participants remained event-free for the duration of the follow-up period, or withdrew consent for researchers to access their CORNET files. In cases where the exact date of the outcome was not available (e.g., participant could not recall), the mid-point between the current and previous interview was used as the date of the outcome. In this study, r*ight* censoring was used. Right censoring is used when only part of the observations are known; in this case, the number of days until outcomes is known for a proportion of individuals (i.e., those with outcomes), whereas the number of days until outcomes for those who have not engaged on violence or recidivism is unknown. Therefore, this

technique allows for varying lengths of follow-up or when participants are no longer “at risk” for adverse outcomes (Cohen et al., 2003).

The Reliable Change Index (RCI; Jacobson & Truax, 1991) was used to determine whether the change in EHAS scores from baseline to follow-up 1, from follow-up 1 to follow-up 2, and from baseline to follow-up 2, was reliable as opposed to statistically significant. The RCI was developed as a result of the suggestion that statistical significance tests which measure treatment efficacy are limited, as they do not provide information pertaining to the variability of responses within the sample. In addition, while statistical tests comment on “real differences;” that is, differences that are not questionable or due to random error, they do not tell us about the importance of the change in individuals’ lives, which is what the RCI can achieve (Jacobson & Truax, 1991).

The RCI can be computed by subtracting the post-test (e.g., Follow-up 1 EHAS score) from the pre-test (e.g., Baseline EHAS score) for each individual, and dividing by the standard error of the differences between the two scores. The latter can be computed using the Standard Error of Measurement of the measure:

$RC = (x_2 - x_1) / S_{diff}$, where $S_{diff} = \sqrt{2}(SE)^2$, and $S_E = sd\sqrt{(1 - r_{xx})}$

If the result of these operations is greater than 1.96 (95% confidence that a real change occurred), then the post-test score is reflecting real change and therefore, this change is described as “reliable change”. If the result is smaller than 1.96, then the participant’s change between post- and pre-test is thought not to have been “reliable”. This was calculated separately in both samples, using data from baseline, follow-up 1, and follow-up 2 scores. Participants were then classified into three groups at each time point: No Change, Reliable decrease, or Reliable increase.

Hierarchical cluster analysis was used to determine whether certain groups of individuals showed similar EHAS score trajectories over time. Through data analysis, cluster analysis reduces large amounts of information into manageable and meaningful groups, without any knowledge of which elements of the groups belong together. As such, it is considered an exploratory tool used to organize information into meaningful groups (called clusters), based on pre-specified variables (Burns & Burns, 2008). Cluster

analysis classifies observations by minimizing within-group differences while maximizing between-group differences, thereby clustering together observations sharing many characteristics and which, at the same time, are very dissimilar to observations that do not belong to that cluster (Mooi & Sarstedt, 2011).

In this case, hierarchical cluster analysis was used to reduce the number of observations (i.e., participants' scores over 3 time points) by grouping them into smaller clusters, to see whether certain groups of individuals show similar trajectories with respect to their EHAS scores over time. Agglomerative hierarchical cluster analysis is the most common method used to find clusters of participants based on specific characteristics. It is called "agglomerative hierarchical clustering" due to the step-by-step clustering of observations, starting with individual observations and merging the two closest clusters (and repeating this sequence) until only one cluster remains. The resulting tree diagram, called a dendogram, plots how the observations are clustered (Tan, Steinbach, & Kumar, 2005).

Hierarchical cluster analysis is a two-part process. In the first part, clusters of observations are formed by examining the "distance" between two observations. The most accepted way of examining the distance between observations is to compute their Euclidean distances, which refers to the straight-line distance between two observations. This distance is then squared, thereby being referred to as the *Squared Euclidean distance*, so that one can place greater weight on observations which have been found to be farther apart (Burns & Burns, 2008; Mooi & Sarstedt, 2011). Ward's method (Ward, 1963) was used to determine the distance between clusters. Using an analysis of variance approach, it is the most common and efficient clustering algorithm, as it calculates the clusters' total sums of squared deviations from the mean (Burns & Burns, 2008)

Based on the output produced by these analyses, researchers can move to the second step, which is choosing the optimal number of clusters (or groups of individuals) that exist. As mentioned above, during the agglomerative hierarchical process, the statistical software calculates every possibility of clustering, starting by giving every observation its own cluster, and then merging observations which were close together. This results in a large number of possibilities for clusters, and determining the optimal

number of clusters for the data is not done through data analysis; rather, it is subjectively chosen by the researcher based on the distances between observations (Mooi & Sarstedt, 2011). Researchers typically plot the “distances” at which clusters are combined using a scree plot, and then search for a distinctive break in the line, called an “elbow” – this is typically the point at which the changes in coefficients (the sum of squares within-cluster at that step) between clusters is the greatest, and then levels off. In addition to this information, researchers can determine the number of clusters in their data through examining dendograms (i.e., tree diagrams). It is important to remember that clusters consisting of four or fewer observations should not be considered clusters, as they are considered unstable due to their size (Burns & Burns, 2008; Tan et al., 2005).

These analyses were performed separately for Total EHAS scores as well as Scale 1 and Scale 2, to determine the trajectories of individual’s scores over time on these scales. The Clustering variables for Total EHAS scores were: EHAS score at baseline, EHAS score at follow-up 1, and EHAS score at follow-up 2. Similarly, clustering variables for Scale 1 was Scale 1 score at baseline, follow-up 1, and follow-up 2. Finally, clustering variables for Scale 2 were Scale 2 at baseline, follow-up 1, and follow-up 2. After having determined the optimal number of clusters for every analysis, Chi-Square and One-Way Analysis of Variance (ANOVA) tests were performed to examine whether there are significant relationships between clusters of individuals and variables of interest, such as psychopathy, age, treatment non-compliance, and outcomes. Post-hoc analyses were conducted when there were significant differences, to determine where differences lied.

2.7. Missing Data

One of the challenges of longitudinal studies is participant attrition, which results in missing data points for certain participants. In this study, a number of steps were used to determine the best way with which to deal with missing data for participants at the first and second follow-up time periods. Research has shown that Multiple Imputation (MI), which is an imputation technique which simulates different possible values for missing

data, is one of the most accurate ways in which to treat missing data in longitudinal studies (Schafer & Olson, 1998).

MI analyses generate a number of plausible values for each missing datum. Rather than replacing the missing data, it creates multiple alternative versions of the data (i.e., as many as are asked for by the researcher). When data are analyzed using a specific statistical procedure, the results are available for (a) the original, non-imputed data, (b) each of the alternative datasets with imputed data, and (c) pooled results, which combines the alternative datasets to provide overall estimates and standard errors. The latter is then used to interpret the results of the analysis (Schafer & Graham, 2003). MI has a number of advantages, such as eliminating the need to re-impute for every analysis, as the dataset can be used for multiple analyses, as well as needing much fewer imputations (or alternative datasets) to achieve precise estimates than other methods (e.g., Monte Carlo methods) (Rubin, 1987).

However, MI has some drawbacks as well. Specifically, it cannot be used to impute independent *and* dependent variables at the same time; it then becomes cumbersome to use a number of different datasets for one set of analyses. In addition, it is not equipped to deal with data that is Missing Not At Random (MNAR), although there are some remedies for this concern, which will be explained below (Krueger, 2011). Lastly, although MI purports to reduce error through the imputation of missing data, Rubin (1987) discussed that it may lead to an increase of error, especially in cases of a high proportion of missing data, as the standard error of the imputed data is not averaged but rather constructed using the within variance of each dataset and the variance between items having been imputed on each dataset, thereby introducing noise due to imputation and residual variance into the regression model. In fact, a study by Newman (2003) examined whether simulating varying proportions of missing data would influence error, and concluded that higher rates of missing data can lead to larger errors in parameter estimates, thereby making it more difficult to obtain accurate imputed data. Specifically, while 25% of missing data did not impact error rates in a meaningful way, analyses performed with 50% missing data produced larger errors which are considered problematic (Newman, 2003).

As previously stated, missing data in multi-wave studies is very common, and this study was impacted by these challenges. Specifically, for the civil psychiatric sample, 118 baseline protocols were collected. A total of 88 (75%) participants completed the EHAS at Follow-up 1, and 73 (62%) participants completed the EHAS at Follow-up 2. For the offender sample, the EHAS had been completed by 56 participants at baseline. A total of 37 (67%) participants completed the EHAS at Follow-up 1, and the EHAS was completed by 20 (43%) of individuals at the second follow-up. Although somewhat lower, these retention rates are comparable to those reported in similar longitudinal studies; for example, Steadman and colleagues (1998) reported an 84% retention rate for the first follow-up, with 72% of participants completing at least three interviews.

Despite the drawbacks mentioned above, MI was used to impute missing EHAS data for follow-up 1 and 2, as well as to impute outcomes. I used the Multiple Imputation – Impute Missing Data Values function of PASW Statistics, Version 18, to impute values for the EHAS and outcomes, separately. Consistent with recommendations, and given the large proportion of missing data in the variable of interest in my sample, I requested 50 imputations for the analyses, which would allow for adequate power and the most accurate estimates (Graham, Olchowski, & Gilreath, 2007). With the assumption that the data were Missing At Random (MAR), I imputed EHAS item scores for all time points, and then computed total scores for each time point – research shows that imputing at the item level and then summing items is advantageous as it results in more accurate estimates and increases power (e.g., Gottschall, West, & Enders, 2012).

While some of the analyses using original data were significant, none of the analyses with imputed (i.e., pooled estimates) data yielded significant results for the hypotheses being tested (e.g., association between EHAS and outcomes), despite the advantage of increased power. I therefore added some predictors to the imputation model, as this has been shown to increase the accuracy of the imputation due to the fact that the procedure has more information to use in the regression in cases when data are MNAR (Krueger, 2011). As a result, I added variables that have been shown to be significantly related to the EHAS (i.e., anger, criminal attitudes, thought disorder factor of the BPRS) and outcomes (i.e., history of violence, history of criminal offence, psychopathy as measured by the PCL:SV for the civil sample, and the PCL-R for the

correctional sample) in past research; however, the results remained unchanged, possibly due to the bias in standard error caused by using imputation on a dataset with a high proportion of missing data (Newman, 2003). Due to these concerns, results presented in this dissertation were analyzed using original data only.

3. Results

3.1. Attrition

Although the larger study consisted of six time points (i.e., one baseline interview and five follow-up interviews), this study used information from the EHAS at the baseline phase as well as the first two follow-ups. Complete data on participant attrition for the first and second follow-ups were previously described. Official data regarding recidivism (charges and convictions) was collected irrespective of whether participants could be located for follow-up interviews. These data were available for 158 participants (91%), but were not available for the 16 participants (9%) who formally withdrew from the research project. The follow-up period ranged from 57 to 1768 days (*M* = 993.99, *SD* = 497.79). Table 1 shows the base rates of outcomes of interest in this study.

Table 1. Base Rates of Outcomes of Interest

Outcomes	***N***	**(%)**
Post-Baseline Recidivism	33	22
Post-Baseline Serious Recidivism	14	8
Violence at Follow-up 1	21	16
Violence at Follow-up 2	20	11
Violence at Any Follow-up	37	29

Note. These percentages are based on data available through CORNET and self-report of individuals in interview. "Serious" recidivism refers to crime against individuals (e.g., assault, uttering threats, sexual interference).

In the civil sample, the average number of days between the baseline interview and the first follow-up was 40.78 (range, 15 to 99, *SD* = 16.57), and 41.58 (range, 25 to 123, *SD* = 18.03) between follow-up 1 and follow-up 2. In the correctional sample, the average number of days between baseline and the first follow-up, and between the first and second follow-ups, were 73.07 (range, 26 to 255, *SD* = 50.72) and 61.36 (range, 27 to 408, *SD* = 105.26), respectively.

When combining both samples, compared with patients who completed at least one follow-up, participants who were lost at follow-up did not differ based on baseline EHAS scores, $t(172) = -.26$, $p = .79$, age, $t(172) = -1.12$, $p = .28$, gender, $\chi^2(1, N = 174) = 1.12$, $p = .29$, previous violence, $\chi^2(1, N = 168) = .01$, $p = .92$, previous contact with the criminal justice system, $\chi^2(1, N = 167) = 1.47$, $p = .23$, or psychopathy, $t(162) = 1.04$, $p = .49$. When performing these analyses separately for each sample, none of the variables were found to differ significantly for participants who completed at least one follow-up compared to those who did not, with one exception; specifically, in the correctional sample, men were significantly more likely to have completed a follow-up than females, χ^2 $(1, N = 56) = 4.98$, $p < .05$, $OR = 3.67$.

3.2. Psychometric Properties of the EHAS

The psychometric properties of the EHAS, the measure of interest, were examined separately in each sample to ensure adequate reliability of the measure. Tables 2 and 3 present the descriptive statistics of the total EHAS scores as well as for Scale 1 and Scale 2 for both samples at baseline, follow-up 1, and follow-up 2. There was one outlier at baseline (defined as a *Z* score greater than 3 or less than -3; Howell, 1998), and two outliers at follow-up 1. Analyses were performed with and without outliers, and the results did not differ; as such, these cases were retained to maximize power.

Intercorrelations between total scores at the different time points were examined separately for each sample and were combined as the pattern of intercorrelations was similar for both samples. The results of the analyses demonstrated a significant correlation between total EHAS scores at baseline and at follow-up 1 ($r = .69$, $p < .001$), follow-up 1 and follow-up 2 ($r = .80$, $p < .001$), and baseline and follow-up 2 ($r = .69$, $p < .001$). With respect to the relationship between Total and Scale Scores, there was a positive and significant association between Total and Scale 1 scores at baseline, follow-up 1, and follow-up 2 (*r*s = .91, .90, and .88, respectively), and significant associations between Total and Scale 2 scores at baseline, follow-up 1, and follow-up 2 (*r*s = .57, .66, .61, respectively). There were significant correlations between Scale 1 and Scale 2 at

baseline (r = .17, p < .05) as well as follow-up 1 (r = .28, p < 01). There was no significant correlation between Scale 1 and Scale 2 at follow-up 2 (r = .16, *ns*).

In the civil psychiatric sample, the Total EHAS scores had acceptable internal consistency at baseline, follow-up 1, and follow-up 2 (α = .80, .78, and .83, respectively). The Mean Inter-item Correlations (MIC) and Corrected Item to Total Correlations (CITC) values were within normal range (see Table 2) (Nunnally & Bernstein, 1994). Similarly, Scale 1 had good internal consistency at all three time points (α = .87, .86, and .87), whereas Scale 2 had lower internal consistency across time points (α = .61, .58, and .66, respectively).

Table 2. Psychometric Properties and Descriptive Statistics of the EHAS in Civil Psychiatric Patients

	N	*M*	*SD*	Range	α	MIC	CITC
EHAS							
Baseline	118	41.50	9.04	21-70	.799	.168	.018 - .685
Follow-up #1	88	38.98	7.72	26-64	.780	.166	.124 - .583
Follow-up #2	73	35.52	9.05	21-69	.825	.208	.034 - .837
Scale 1							
Baseline	118	22.99	7.71	12-48	.866	.365	.433 - .738
Follow-up #1	88	20.06	6.16	12-44	.856	.322	.268 - .652
Follow-up #2	72	19.74	7.12	12-46	.870	.407	.357 - 765
Scale 2							
Baseline	118	18.51	3.97	8-28	.610	.163	.077 - .431
Follow-up #1	88	18.92	3.58	9-26	.584	.150	.165 - .371
Follow-up #2	71	19.07	4.09	10-28	.657	.193	.228 - .519

Notes. MIC = Mean Inter-item Correlation
CITC = Corrected Item-to-Total Correlations.

With respect to the correctional sample, Total EHAS scores had good internal consistency at the three time points (α = .85, .85, and .86, respectively), as well as good MIC and CITC values. Scale 1 scores also had good internal consistency (range, α = .90 to .91), whereas Scale 2 had poor to adequate reliability (range, α = .49 to .77), with good MIC and CITC values (see Table 3).

Table 3. Psychometric Properties and Descriptive Statistics of the EHAS in Criminal Offenders

	N	*M*	*SD*	Range	α	MIC	CITC
EHAS							
Baseline	56	39.63	10.07	20-67	.848	.230	-.040 - .709
Follow-up #1	35	38.11	10.06	21-64	.850	.268	.052 - .772
Follow-up #2	24	38.42	9.74	20-64	.863	.239	.120 - .717
Scale 1							
Baseline	56	20.66	7.84	12-47	.897	.421	.401 - .732
Follow-up #1	35	18.50	7.53	12-44	.905	.514	.407 - .810
Follow-up #2	24	19.45	7.90	12-41	.900	.526	.555 - .884
Scale 2							
Baseline	56	18.96	4.26	8-28	.653	.183	.091 - .535
Follow-up #1	35	19.57	4.26	9-28	.493	.109	.039 - .399
Follow-up #2	24	18.96	5.17	8-27	.765	.209	.207 - .657

Notes. MIC = Mean Inter-item Correlation
CITC = Corrected Item-to-Total Correlations.

3.3. Potential Covariates

Two variables (i.e., gender and type of sample) were chosen as potential covariates of the relationship between the EHAS and outcomes of interest. Gender was chosen as it was thought that men may have higher base rates of outcomes than women; similarly, it was thought that the offender sample may have higher base rates of outcomes than the civil sample. A series of chi-square tests was performed to examine whether the base rates of outcomes were significantly different across gender and type of sample. Results demonstrated that although men had significantly higher EHAS scores than women at baseline, $t(172) = 2.83$, $p < .05$, gender was not significantly associated with any outcome (i.e., recidivism, serious recidivism, or violence). However, despite a lack of significant differences in EHAS scores between the criminal and civil samples, analyses showed that the type of sample was significantly associated with recidivism, with the correctional sample having higher rates of recidivism and serious recidivism than the civil sample, χ^2 (1, $N = 147$) = 56.77, $p < .001$, $OR = 29.87$, and χ^2 (1, $N = 147$) = 10.88, $p < .001$, $OR = 6.38$, respectively. There was no significant

association between the type of sample and any of the violence variables. Therefore, the type of sample was used as a covariate only in further analyses involving recidivism and serious recidivism; gender was not used as a covariate given its lack of association with outcomes.

3.4. Invalid Cases

The PPI-R Inconsistent Responding-40 scale was used to determine whether certain cases were invalid in the correctional sample; no validity measures were incorporated in the civil sample. Results demonstrated that 10 (18%) cases were considered invalid according to the IR40 scale; main analyses were conducted both including and excluding the invalid cases, and results did not differ significantly. In addition, recent research suggests that the PPI-R may be too liberal with respect to its validity scales, categorizing significantly more individuals as having invalid profiles compared to other measures with similar scales (e.g., Personality Assessment Inventory) (Nikolova, Hendry, Douglas, Edens, & Lilienfeld, 2012). As such, all cases were included in the analyses.

3.5. Research Question 1: Are scores on the EHAS predictive of violence and recidivism?

Logistic regression was used to examine the relationship between EHAS scores and outcomes of interest; the type of sample was used as a covariate in analyses pertaining to recidivism and serious recidivism. Analyses were performed using Total EHAS scores as well as Scale 1 and Scale 2 scores, both at baseline and at the first follow-up. With respect to violence, results demonstrated that Total EHAS scores at baseline were significantly predictive of Violence at Follow-up 1, Wald χ^2 (1) = 5.03, $p < .05$, $R^2 = .07$ (see Table 4). Similarly, as demonstrated in Table 5, Scale 1 scores at baseline were also a significant predictor of Violence at Follow-Up 1, Wald χ^2 (1) = 4.46, $p < .05$, $R^2 = .06$. No significant associations were found between Scale 2 and any of the violence variables.

Table 4. Logistic Regression Examining the Relationship Between Baseline Total EHAS Score and Violence at Follow-up 1

Criterion/Predictor	B	SE (B)	Wald	e^B	Sig.
Violence at Follow-up 1					
(Constant)	-3.991	1.127	12.539	.018	.000
EHAS Total	.056	.025	5.030	1.057	.025

Note. *N* = 126.

Table 5. Logistic Regression Examining the Relationship Between Baseline Scale 1 Scores and Violence at Follow-up 1

Criterion/Predictor	B	SE (B)	Wald	e^B	Sig.
Violence at Follow-up 1					
(Constant)	-2.995	.731	16.804	.050	.000
Scale 1	.058	.028	4.458	1.060	.035

Note. *N* = 126.

Similar analyses were also conducted for recidivism and serious recidivism, and included the type of sample as a covariate. To determine whether the EHAS explained a significant amount of variance after controlling for the type of sample, the latter variable was entered in Block 1, and EHAS scores were entered as the second block. Results demonstrated that the baseline Total and Scale scores did not add significantly to any analyses, with one exception. Specifically, Scale 2 scores at baseline were predictive of recidivism after controlling for type of sample, Wald χ^2 (1) = 5.71, $p < .05$ (see Table 6).

Analyses were also performed using scores at the first follow-up as predictors. With respect to violence, results demonstrated that Total EHAS scores at follow-up 1 were a significant predictor of Violence at Follow-Up 2 (see Table 7), Wald χ^2 (1) = 4.28, $p < .05$, $R^2 = .07$, and that Scale 1 scores at the first follow-up were approaching significance in predicting Violence at Follow-up 2, Wald χ^2 (1) = 3.63, $p = .06$, $R^2 = .06$. No other associations were found between EHAS scores and other outcomes, and the EHAS was not predictive of recidivism after controlling for the type of sample. No significant associations were found between EHAS scores at follow-up 2 and any of the outcomes (i.e., recidivism or violence at any follow-up).

Table 6. Logistic Regression Examining the Relationship Between Scale 2 Scores and Recidivism

Criterion/Predictor	B	SE (B)	Wald	e^B	Sig.
Recidivism					
Step 1					
(Constant)	.442	.302	2.139	.033	.144
Site	-3.397	.549	38.245	1.556	.001
Step 2					
(Constant)	-2.521	1.273	3.921	.080	.048
Site	-3.574	.583	37.640	.028	.001
Scale 2	.160	.067	5.710	1.174	.017

Note. N = 147. R^2 = 522. Δ R^2 = .044.

Table 7. Logistic Regression Examining the Relationship Between Follow-up 1 Total EHAS Scores and Violence at Follow-up 2

Criterion/Predictor	B	SE (B)	Wald	e^B	Sig.
Violence at Follow-up 2					
(Constant)	-3.859	1.229	9.852	.021	.002
EHAS Total	.060	.029	4.275	1.062	.039

Note. N = 123.

3.6. Research Question 2: Do EHAS scores change over time?

Paired samples *t*-tests and test-retest reliability analyses using Pearson's Product Moment Correlation were performed on the combined sample to determine whether EHAS scores show significant changes over time. Results demonstrate that Total EHAS scores significantly decreased from baseline to follow-up 1, $t(121) = 3.70$, $p < .001$, as well as from baseline to follow-up 2 $t(94) = 2.95$, $p < .01$, but there was no significant difference between Total EHAS scores at follow-up 1 and follow-up 2. Similar results were obtained for Scale 1, as scores significantly decreased from baseline to follow-up 1, $t(121) = 5.26$, $p < .001$, and from baseline to follow-up 2, $t(95) = 4.19$, $p < .001$. However, there were no significant differences for Scale 1 between follow-up 1 and follow-up 2, and no differences in Scale 2 scores from baseline to follow-up 1, follow-up

1 to follow-up 2, or baseline to follow-up 2. Test-retest reliability for Total EHAS scores was .69 from baseline to follow-up 1, .80 from follow-up 1 to follow-up 2, and .69 from baseline to follow-up 2. With respect to Scale 1, test-retest reliability was .69 from baseline to follow-up 1, .75 from follow-up 1 to follow-up 2, and .64 from baseline to follow-up 2. Finally, test-retest reliability for Scale 2 was .66 from baseline to follow-up 1, .71 from follow-up 1 to follow-up 2, and .69 from baseline to follow-up 2. These coefficients were all significant at the $p < .001$ level but considered lower than what is traditionally "acceptable" (i.e., >.80; Nunnally & Bernstein, 1994).

Similar analyses were conducted on both samples separately. In the civil sample, results showed that Total EHAS scores decreased significantly from baseline to follow-up 1, $t(87) = 3.51$, $p < .001$, as well as baseline to follow-up 2, $t\ (70) = 2.71$, $p < .01$, but did not change significantly from the first to the second follow-up. Scale 1 also showed similar changes as it decreased significantly from baseline to follow-up 1, $t\ (87) = 4.59$, $p < .001$, as well as baseline to follow-up 2, $t\ (70) = 3.75$, $p < .001$, but not from the first to the second follow-up. Finally, while Scale 2 did not change significantly from baseline to the first follow-up or from the first to the second follow-up, there was a significant increase in scores from baseline to follow-up 2, $t\ (70) = -2.02$, $p < .05$. Test-retest reliability for Total EHAS scores was .71 from baseline to follow-up 1, .80 from follow-up 1 to follow-up 2, and .68 from baseline to follow-up 2. With respect to Scale 1, test-retest reliability was .69 from baseline to follow-up 1, .75 from follow-up 1 to follow-up 2, and .60 from baseline to follow-up 2. Finally, test-retest reliability for Scale 2 was .63 from baseline to follow-up 1, .71 from follow-up 1 to follow-up 2, and .70 from baseline to follow-up 2.

In the correctional sample, Total EHAS scores did not significantly change between time periods. Results demonstrated that Scale 1 decreased significantly from baseline to follow-up 1, $t(33) = 2.59$, $p < .05$, but not between the other time points. Finally, Scale 2 scores did not differ significantly over time. Test-retest reliability for Total EHAS scores was .66 from baseline to follow-up 1, .82 from follow-up 1 to follow-up 2, and .73 from baseline to follow-up 2. With respect to Scale 1, test-retest reliability was .67 from baseline to follow-up 1, .76 from follow-up 1 to follow-up 2, and .74 from baseline to follow-up 2. Finally, test-retest reliability for Scale 2 was .69 from baseline to follow-up 1, .71 from follow-up 1 to follow-up 2, and .66 from baseline to follow-up 2.

A more in-depth way in which to examine whether EHAS scores change over time is to calculate each individual's Reliable Change Index (RCI). The RCI was computed for each participant from baseline to follow-up 1, follow-up 1 to follow-up 2, as well as baseline to follow-up 2. This was done for Total EHAS Scores as well as for Scale 1 and Scale 2, and was computed separately for each sample based on the formula presented in the *Statistical Analyses* section. Participants were grouped on the basis of whether they had demonstrated reliable change over time; the distribution of participants in the No Change, Reliable Decrease, and Reliable Increase for each EHAS score can be found in Figures 1, 2, and 3.

In the combined sample, with respect to changes in Total EHAS Scores from baseline to follow-up 1, the results demonstrate that only 8 (7%) participants showed a reliable significant increase, and 4 (3%) participants showed a reliable decrease in scores over time, while the majority of individuals (90%) did not exhibit such a change (see Figure 1). Results also showed that 50 (41%) participants' Scale 1 scores reliably decreased over this same time period, while 15 (12%) participants' scores increased. Participants' scores on Scale 2 were more likely to increase (15%) than decrease (10%) from baseline to follow-up 1, though the majority of participants did not show reliable change.

Similar results were obtained for changes in scores from the first to the second follow-up (see Figure 2). During this time period, only 5 (5%) participants' scores decreased reliably, and 5 (5%) demonstrated a reliable increase. A number of participants' Scale 1 scores decreased (n = 17; 18%), while 12 (13%) participants' scores increased. With respect to Scale 2, again most participants' (n = 78; 83%) remained stable, while 9 (10%) decreased and 7 (7%) increased.

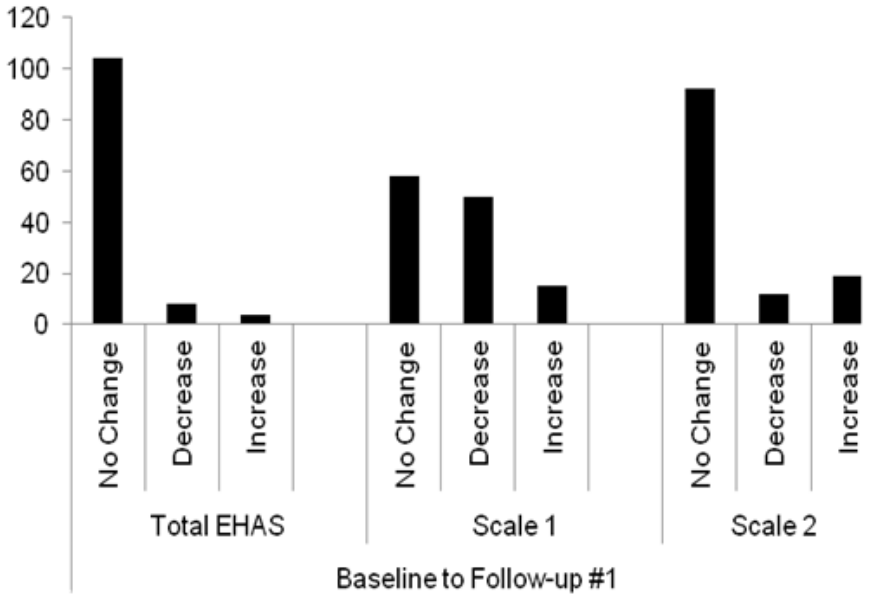

Figure 1. Number of Participants with Reliable Change from Baseline to Follow-up 1

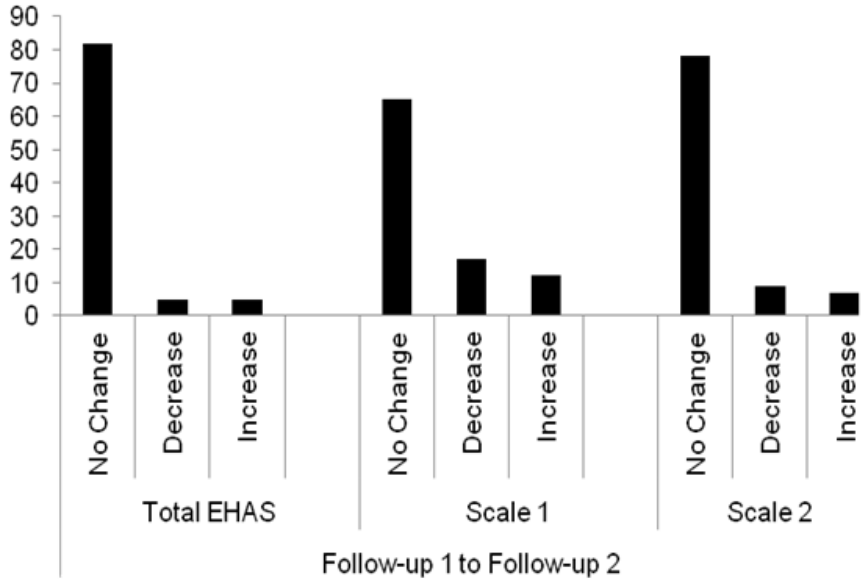

Figure 2. Number of Participants with Reliable Change from Follow-up 1 to Follow-up 2

Finally, with respect to changes from baseline to the second follow-up, results showed that most participants' Total EHAS scores remained stable (see Figure 3); however, 13 (13%) participants exhibited a reliable decrease in scores, while 2 (2%)

participants' scores increased reliably during this time period. For Scale 1, 19 participants (20%) exhibited a reliable decrease, and 5 (5%) showed a reliable increase, while for Scale 2, only 3 (3%) participants' scores decreased reliably, while 2 (2%) increased reliably. Analyses pertaining to differences in participants showing no change, a reliable increase, or reliable decreased will be presented later in the *Results* section. Given the similarity of the results when analyses were conducted with both subsamples separately, the reader is referred to Figures 4 through 6 for graphs depicting the number of individuals in the "increase," "decrease," and "no change" groups for the different samples, EHAS scores, and time periods.

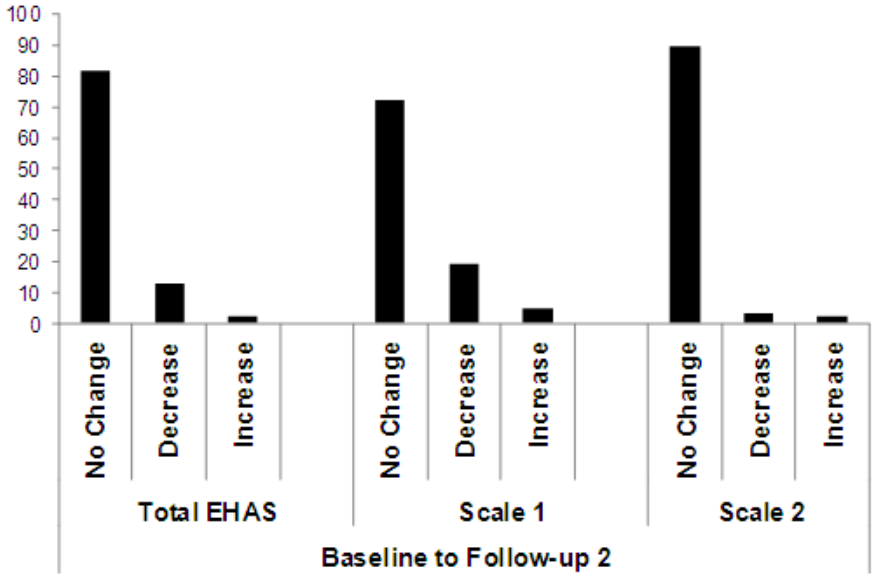

Figure 3. ***Number of Participants with Reliable Change from Baseline to Follow-up 2***

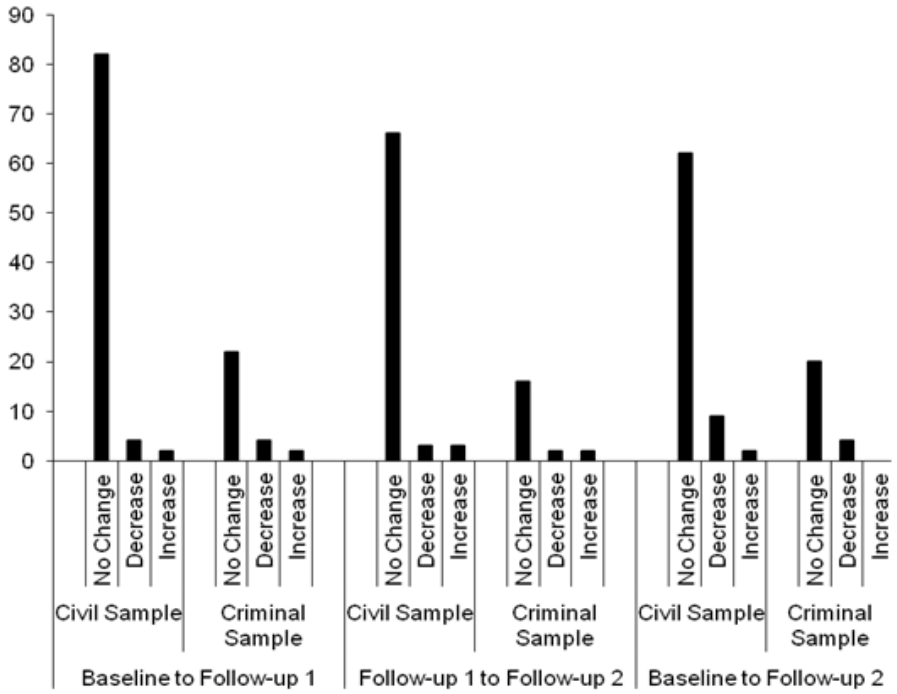

Figure 4. Number of Participants with Reliable Change for Total EHAS Scores

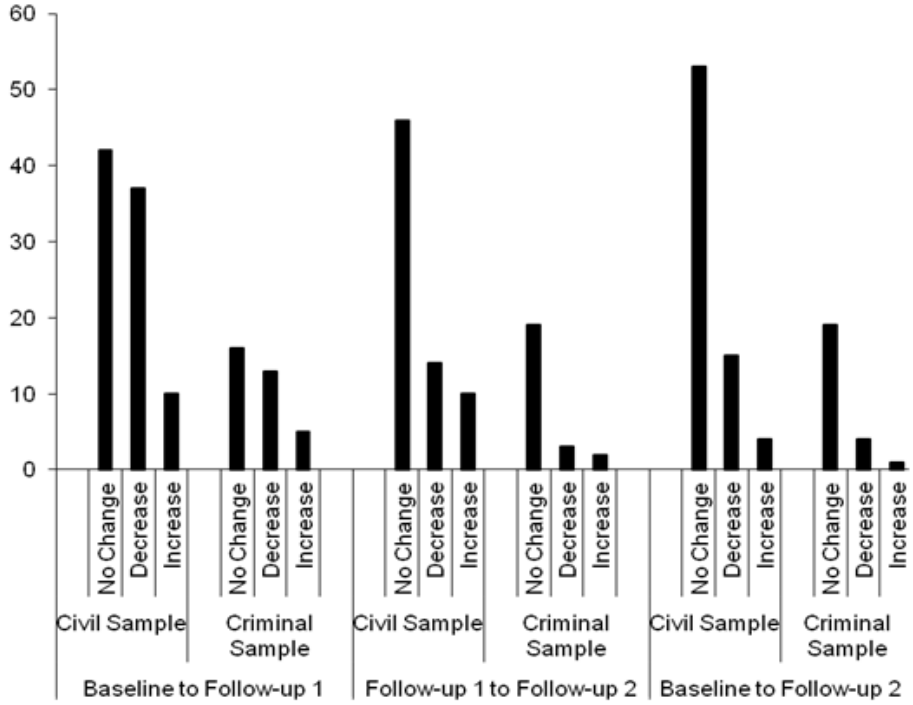

Figure 5. Number of Participants with Reliable Change for Scale 1 Scores

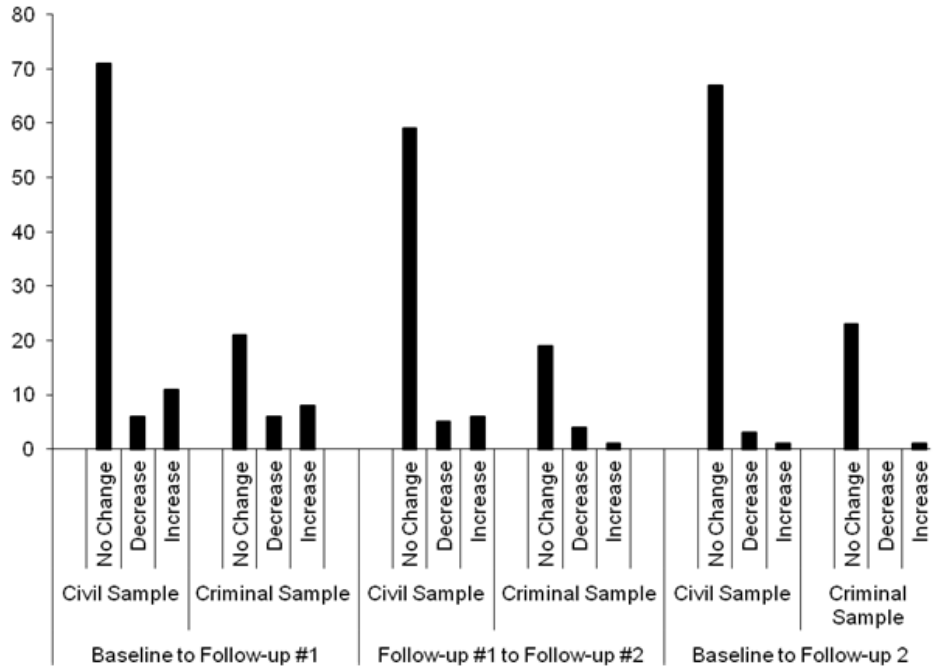

Figure 6. Number of Participants with Reliable Change for Scale 2 Scores

3.7. Research Question 3: Is the degree of change over time on the EHAS related to violence and recidivism?

To further examine the dynamic nature of the EHAS, "change" variables were created to investigate the relationship between changes in EHAS scores over time vis-à-vis outcomes of interest, rather than relying on the baseline scores. To this end, I created variables measuring change between (a) baseline and follow-up 1 scores, (b) follow-up 1 and follow-up 2, and (c) baseline and follow-up 2. These variables were created for Total as well as Scale 1 and Scale 2 scores. Table 8 presents the results showing that an increase in Scale 2 scores from baseline to follow-up 1 was predictive of Violence at follow-up 1, Wald χ^2 (1) = 4.04, p < .05. However, no other changes in scores from baseline to follow-up 1, or follow-up 1 to follow-up 2, or baseline to follow-up 2 were predictive of outcomes.

Table 8. Logistic Regression Examining the Relationship Between Changes in Scale 2 Scores from Baseline to Follow-up 1 and Violence at Follow-up 1

Criterion/Predictor	B	SE (B)	Wald	e^B	Sig.
Violence at Follow-up 1					
(Constant)	-1.820	.283	41.281	.162	.044
Scale 2 Change Score	.176	.088	4.038	1.192	.044

Note. N = 123.

Using the Reliable Change Index (RCI), chi square analyses were conducted to determine whether individuals who were in the "increase," "decrease," or "no change" group differed with respect to their likelihood of violence and recidivism – only significant results are presented here. Analyses were conducted using the complete sample first, and then using the subsamples. In the complete sample, there was a significant difference in the rates of Violence at Follow-up 2 between groups when reliable changes in Total EHAS scores were considered from baseline to follow-up 2, χ^2 (2, N = 97) = 8.98, p < .05; follow-up analyses demonstrated that this significant difference was due to the "increase" group being more likely to be violent than the "decrease" group. Results also demonstrated a significant difference in the rates of Violence at Follow-up 1 between groups in reliable change on Scale 1 from baseline to the first follow-up, χ^2 (2, N = 123) = 7.16, p < .05; however, further analyses aiming to determine which group was driving this difference did not produce significant results. Similarly, using Scale 2 scores from baseline to follow-up 1, groups were significantly different in their associations with recidivism, χ^2 (2, N = 114) = 12.11, p < .01, as well as serious recidivism, χ^2 (2, N = 114) = 6.50, p < .05. Follow-up analyses demonstrated that, for both recidivism and serious recidivism, the significant association was due to the "decrease" group being significantly more likely to have recidivated than the "no change" group.

Again using the RCI, in the civil sample, a significant association was found between groups for the Total EHAS scores from baseline to follow-up 2 with respect to Violence at follow-up 2, χ^2 (2, N = 73) = 11.94, p < .01, Violence at Any Follow-up, χ^2 (2, N = 73) = 8.69, p < .05, and Serious Recidivism, χ^2 (2, N = 68) = 6.25, p < .05. In the criminal sample, a significant relationship was found between the groups for Scale 2

scores from baseline to follow-up 1 and recidivism, χ^2 (2, N = 33) = 5.98, p < .05. In addition, there was a significant association between groups for Scale 2 from follow-up 1 to follow-up 2 with respect to Violence at Follow-up 2, χ^2 (2, N = 24) = 6.53, p < .05. Due to the fact that most of the groups in the subsamples had very few participants in each cell, follow-up analyses were not conducted.

The total sample was then separated into four same-size groups (i.e., quartiles) based on the degree of change in the EHAS over time, to examine whether adverse outcomes could be associated with groups of individuals who exhibited similar degrees of change on the EHAS over time. Different quartiles were created based on participants' change on EHAS Total, Scale 1, and Scale 2 scores from baseline to follow-up 1, and follow-up 1 to follow-up 2. Chi-square was then used to determine whether different groups were differentially associated with outcomes.

Results showed no association between quartiles and outcomes for changes in Total and Scale 1 scores from baseline to follow-up 1. However, there was a significant relationship between groups of individuals having changed on Scale 2 during this time period and Violence at Follow-up 1, χ^2(1, N = 123) = 8.57, p < .05. A closer look at this association showed that this association was due to the high rates of violence in the 4th quartile (i.e., participants with the highest increases in scores). No relationship was found between quartiles of changes in scores from the first to second follow-up with respect to outcomes.

Next, I examined whether changes in EHAS scores were a significant predictor of outcomes regardless of scores at baseline[5]. In addition, the relationship between changes in EHAS scores between follow-up 1 and follow-up 2, regardless of follow-up 1 scores, was examined. Given that change may be associated with a person's initial score, controlling for this initial score results in a more accurate examination of the change scores. To do so, original baseline scores as well as "change" scores between baseline and follow-up 1 were entered in Block 1, and the interaction of these two variables was entered in Block 2. Similar analyses were performed for follow-up 1 scores

[5] For a subset of analyses (i.e., change in EHAS scores from baseline to follow-up 1, with outcomes at follow-up 2), I also examined whether changes in EHAS scores were predictive of outcomes above and beyond baseline scores. No significant associations were found.

and changes in scores from follow-up 1 to follow-up 2. The interaction between Scale 1 scores at Follow-up 1 and the "change" score between follow-up 1 and follow-up 2 demonstrated a trend towards significance in predicting violence at follow-up 2 while controlling for the change score and follow-up 1 score, R^{Δ}= .08, F (1, 92) = 3.76, p = .05. No other analyses were significant.

3.8. Research Question 4: Are scores on the EHAS associated with the amount of time until violence or recidivism?

A series of Cox Proportional Hazard Analysis was performed to determine whether the EHAS was related to the time until violence perpetration and time until recidivism, both calculated in days. To do so, the predictor in the analysis was either the various EHAS scores or the changes in EHAS scores over time, and predictors were considered time-constant. The type of sample was entered as a covariate for analyses involving recidivism and serious recidivism. Results showed that there was no significant relationship between EHAS scores and time until violence, either with original EHAS scores or with changes in scores over time.

However, there were some associations between EHAS scores and recidivism. Specifically, as shown in Tables 9 and 10, after controlling for the type of sample, Scale 1 scores at follow-up 1 were associated with time until recidivism (HR = 1.07, p < .05) and time until serious recidivism (HR = 1.15, p < .05). Lastly, decreases in Scale 1 scores from follow-up 1 to follow-up 2 were associated with faster recidivism (HR = .78, p < .05; see Table 11), after controlling for the type of sample.

Table 9. Cox Regression Coefficients for the Association Between Time to Recidivism and Scale 1 Scores at Follow-up 1

					95% CI		
	B	***Wald***	***df***	***HR***	**Lower**	**Upper**	***p***
Block 1							
Type of sample	-2.055	7.286	1	.128	.029	.570	.007
Block 2							
Type of Sample	-2.641	10.322	1	.071	.014	.357	.001
Scale 1 FU1 scores	.069	4.404	1	1.071	1.005	1.143	.036

Note. HR = Hazard Ratio.

Table 10. Cox Regression Coefficients for the Association Between Time to Recidivism and Changes in Scale 1 Scores from Follow-up 1 to Follow-up 2

					95% CI		
	B	***Wald***	***df***	***HR***	**Lower**	**Upper**	***p***
Block 1							
Type of sample	-1.976	6.608	1	.139	.031	.625	0.10
Block 2							
Type of Sample	-2.656	10.047	1	.070	.014	.363	.002
ΔScale 1, FU1-FU2	-.250	5.422	1	.779	.631	.961	.020

Note. HR = Hazard Ratio.

Table 11. Cox Regression Coefficients for the Association Between Time to Serious Recidivism and Scale 1 Scores at Follow-up 1

					95% CI		
	B	***Wald***	***df***	***HR***	**Lower**	**Upper**	***p***
Block 1							
Type of sample	-2.139	3.862	1	.118	.014	.994	.049
Block 2							
Type of Sample	-2.915	5.719	1	.054	.005	.591	.017
Scale 1 FU1 scores	.143	3.929	1	1.154	1.002	1.329	.047

Note. HR = Hazard Ratio.

3.9. Research Question 5: Are there groups of individuals who show the same pattern of change over time and, if so, do these groups have different rates of violence and recidivism?

Hierarchical cluster analysis was used to determine whether groups of individuals' EHAS scores showed the same trajectory over time; therefore, the clustering variables for these analyses were the EHAS scores at different time points. Hierarchical cluster analysis using Ward's Method reduces the data to "subgroups" of individuals without prior knowledge about group membership. Hierarchical cluster analysis is analogous to exploratory factor analysis in that it sorts individual datum into groups, which is a more manageable way to examine data (Burns & Burns, 1998). As such, this method is ideal to create groups of individuals whose EHAS scores are following a similar trajectory over time, and to examine which variables are related to these groups. Hierarchical cluster analysis was performed to examine trajectories of EHAS Total scores over time; in addition, similar analyses were performed to examine trajectories of Scale 1 and Scale 2 scores over time.

Results demonstrated that, for the Total EHAS scores, a 5-cluster solution fit the data best. A scree plot (see Figure 7) demonstrates that coefficient scores decrease markedly until the 5th cluster, at which point they keep decreasing but level off to some extent. As the recommended guideline for choosing the number of clusters is to examine when the coefficient starts to level off, the 5-cluster solution was chosen as the best fit

for the data. The next step was to re-run the analysis while specifying a 5-cluster solution; during this process, every participant was assigned to one of five clusters, based on the pattern of the data over time. This is similar to confirmatory factor analysis, which imposes a certain structure onto the data, which the data must in turn fit. Figure 8 shows the mean EHAS Total scores of each group at different time points after participants were assigned to one of five clusters. As can be seen from Figure 8, the groups have distinctly different trajectories: the first group's EHAS scores decreased from baseline to the first follow-up, but then leveled off; the second group's scores increased and then decreased slightly; the third group's scores increased during both follow-up periods, and so on.

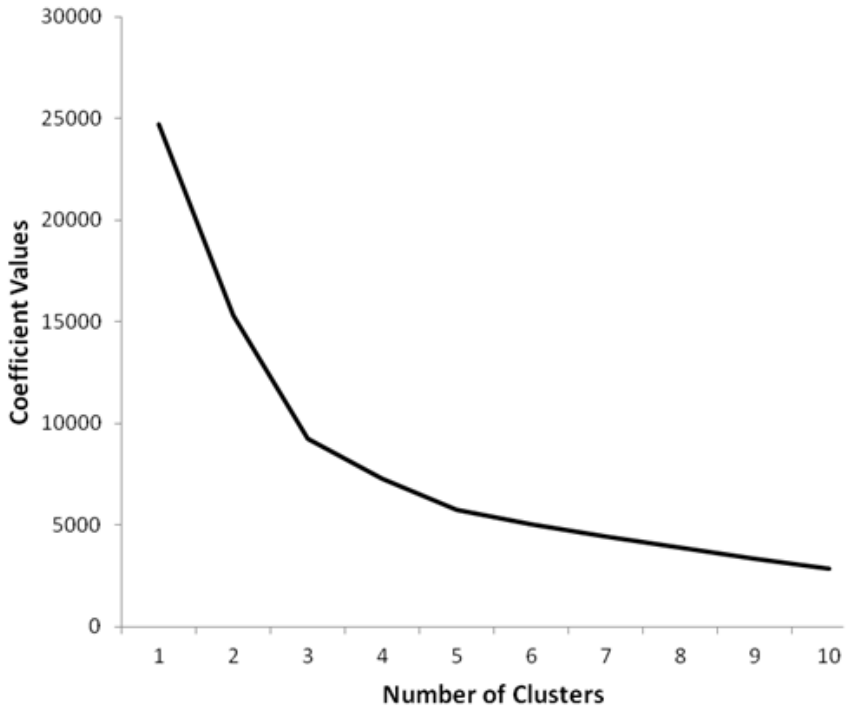

Figure 7. Scree Plot Demonstrating the Coefficient Values of Hierarchical Cluster Analysis for Total EHAS Scores by Number of Clusters

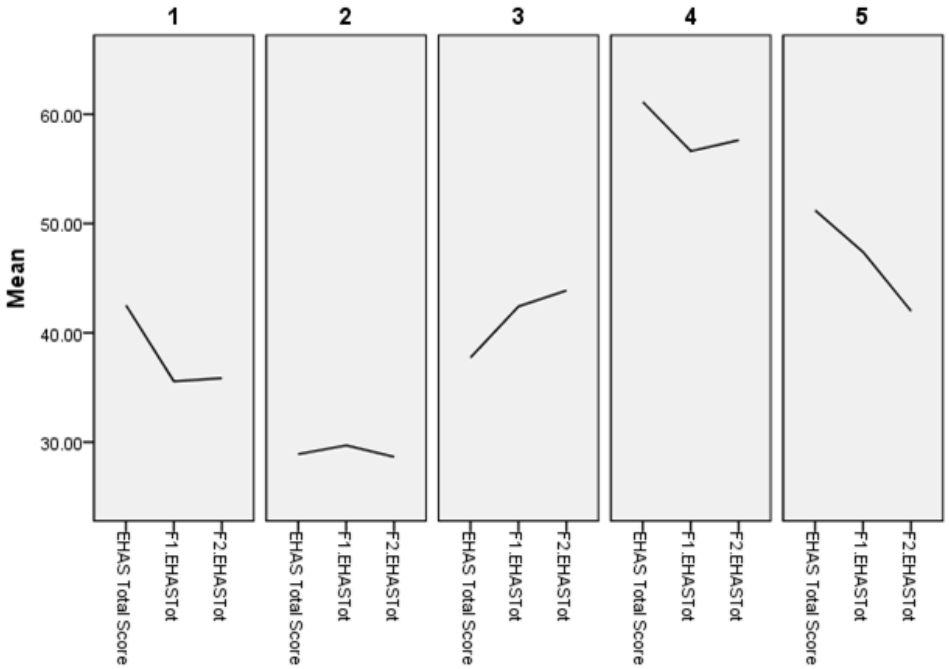

Figure 8. Mean of EHAS Total Scores for Each Cluster at Baseline, Follow-up 1, and Follow-up 2

After obtaining the group membership of each individual, additional analyses were performed to determine whether group membership was associated with violence and recidivism. Results of Chi-square analyses demonstrated that group membership was not associated violence or recidivism during the follow-up period. Despite the lack of significant associations, it should be noted that the results were in the anticipated direction; that is, the number of individuals having recidivated or perpetrated violence was higher in groups where EHAS scores were higher or increasing over time. For instance, in the association between EHAS scores and recidivism, only 18% (*n* = 11) of participants who recidivated were in groups which either had low EHAS scores (i.e., Group 2) or showed a decrease in EHAS scores over time (i.e., Group 1 and Group 5). In contrast, 30% (*n* = 9) of participants who were in groups where scores were either high on the EHAS (i.e., Group 4) or increased over time (i.e., Group 3) recidivated during the follow-up period.

Similar results were found for Violence at follow-up 1, where 14% (*n* = 9) of participants in Groups 1, 2, and 5 (i.e., groups whose scores were either low or

decreasing) were violent at follow-up 1, while 27% (n = 8) of participants in Groups 3 and 4 (i.e., groups with high or increasing EHAS scores over time) were violent at follow-up 1. For violence at follow-up 2, 17% (n = 11) of participants in the low or decreasing EHAS groups (i.e., Groups 1, 2, and 5) were perpetrators of violence, while 23% (n = 7) of participants in the high or increasing EHAS groups (i.e., Groups 3 and 4) were violent. Finally, 31% (n = 20) of participants in the lower or decreasing EHAS groups were Violent at Any follow-up, while 40% (n = 12) of participants in the increasing or high EHAS groups were violent during the same time period.

A similar process was used to create clusters of individuals based on Scale 1 scores. Hierarchical cluster analysis was used to choose the optimal number of clusters based on participants' Scale 1 scores over time. Figure 9 depicts the scree plot of coefficient values for the various numbers of clusters, which shows that the coefficient values start to level off around the 3rd cluster. As such, a 3-cluster solution was chosen as the best fit for the data, and participants were assigned to one of three groups based on their Scale 1 scores at baseline, follow-up 1, and follow-up 2 (see Figure 10 for group trajectories).

After obtaining this information, analyses were performed to determine whether group membership was associated with outcomes. Chi-square analyses demonstrated that there was a significant difference in the rates of violence at first and second follow-ups between the groups, χ^2 (2, N = 95) = 8.23, p < .05, and χ^2 (2, N = 95) = 5.98, p < .05, respectively. Follow-up analyses showed that there was a significant difference in the rates of violence between Group 2 (i.e., low and stable Scale 1 scores) and Group 3 (i.e., high but decreasing Scale 1 scores) for both time points, such that on both occasions, members of Group 3 were more likely to be violent than members of Group 2, χ^2 (1, N = 55) = 5.91, p < .05, and χ^2 (1, N = 55) = 6.07, p < .05, respectively. Specifically, 13% (n = 5) of participants in Group 1 (i.e., lower and decreasing scores), 14% (n = 6) of participants in Group 2 (i.e., low and stable scores), and 46% (n = 6) of participants in Group 3 (i.e., high but decreasing scores) were violent at follow-up 1, while 23% (n = 9) of participants in Group 1, 9.5% (n = 4) of participants in Group 2, and 39% (n = 5) of participants in Group 3 were violent at follow-up 2.

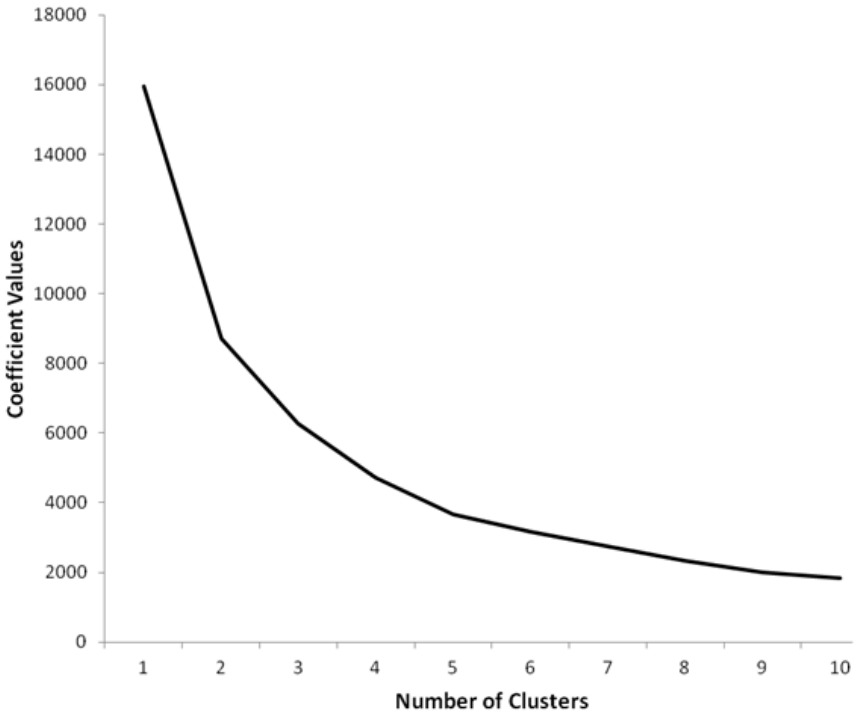

Figure 9. Scree Plot Demonstrating the Coefficient Values of Hierarchical Cluster Analysis for Scale 1 Scores by Number of Clusters

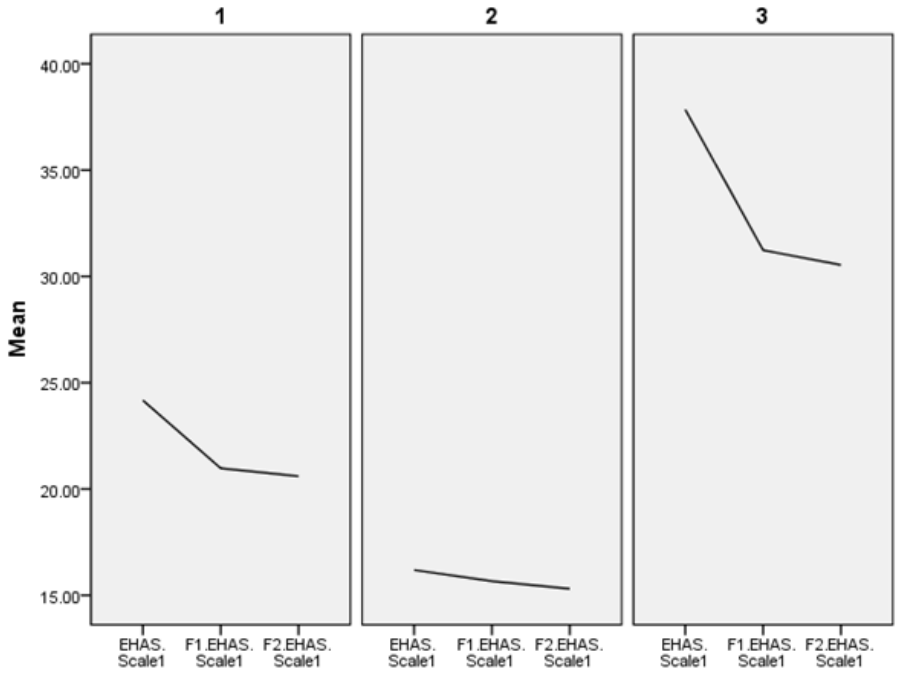

Figure 10. Mean of Scale 1 Scores for Each Cluster at Baseline, Follow-up 1, and Follow-up 2

With respect to non-significant associations, the results were again in the anticipated direction. With respect to Violence at Any Follow-up, 33% (n = 13) of participants in Group 1 (i.e., low and decreasing scores) endorsed violence during the follow-up period, whereas 29% (n = 12) of participants in Group 2 (i.e., low and stable scores) and 53% (n = 7) of participants in Group 3 (i.e., high but decreasing scores) were violent during that time period. Further, analyses showed that 13% (n = 5) of participants in Group 1, 24% (n = 10) of participants in Group 2, and 39% (n = 5) of participants in Group 3 recidivated after the baseline interview.

Lastly, these analyses were performed on Scale 2 scores. Similar to Scale 1, a 3-cluster solution was deemed the best fit for the data (see Figure 11). After assigning participants to one of three groups (see Figure 12 for group trajectories), I performed Chi-Square tests to determine whether there were group differences with respect to outcomes.

Analyses showed that there was a significant difference between groups with respect to violence at follow-up 1, χ^2 (2, N = 94) = 13.83, p < .001. Follow-up analyses demonstrated that this association was due to the significant difference between the first (n = 3; 12%) and second group (n = 9; 47%), with the second group (i.e., higher and increasing Scale 2 scores) being more likely to have been violent during the first follow-up period, χ^2 (1, N = 44) = 6.81, p < .01, than the first group (i.e., lower, relatively stable Scale 2 scores), as well as a significant difference between the second and third group (n = 5; 10%), again with the members of the second group having engaged more frequently in violence than members of the third group (i.e., moderately high and stable Scale 2 scores), χ^2 (1, N = 69) = 11.89, p < .001. Though not significant, results were similar for Violence at Follow-up 2 as well as Violence at Any Follow-up. Specifically, analyses demonstrate that 20% (n = 5) of participants in Group 1, 32% (n = 6) of participants in Group 2, and 14% (n = 7) of participants in Group 3 were violent at the second follow-up, while 36% (n = 9) of participants in Group 1, 47% (n = 9) of participants in Group 2, and 28% (n = 14) of participants in Group 3 were violent at any time during the follow-up period.

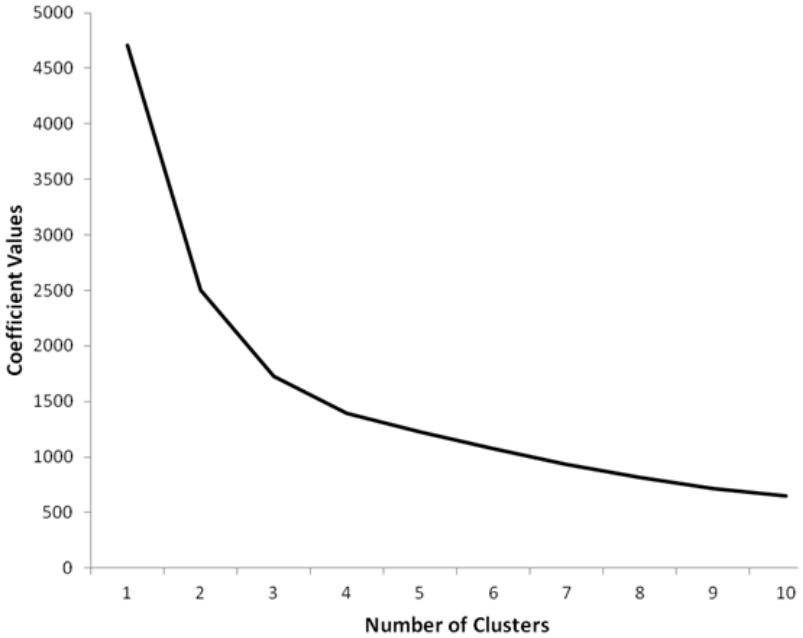

Figure 11. Scree Plot Demonstrating the Coefficient Values of Hierarchical Cluster Analysis for Scale 2 Scores by Number of Clusters

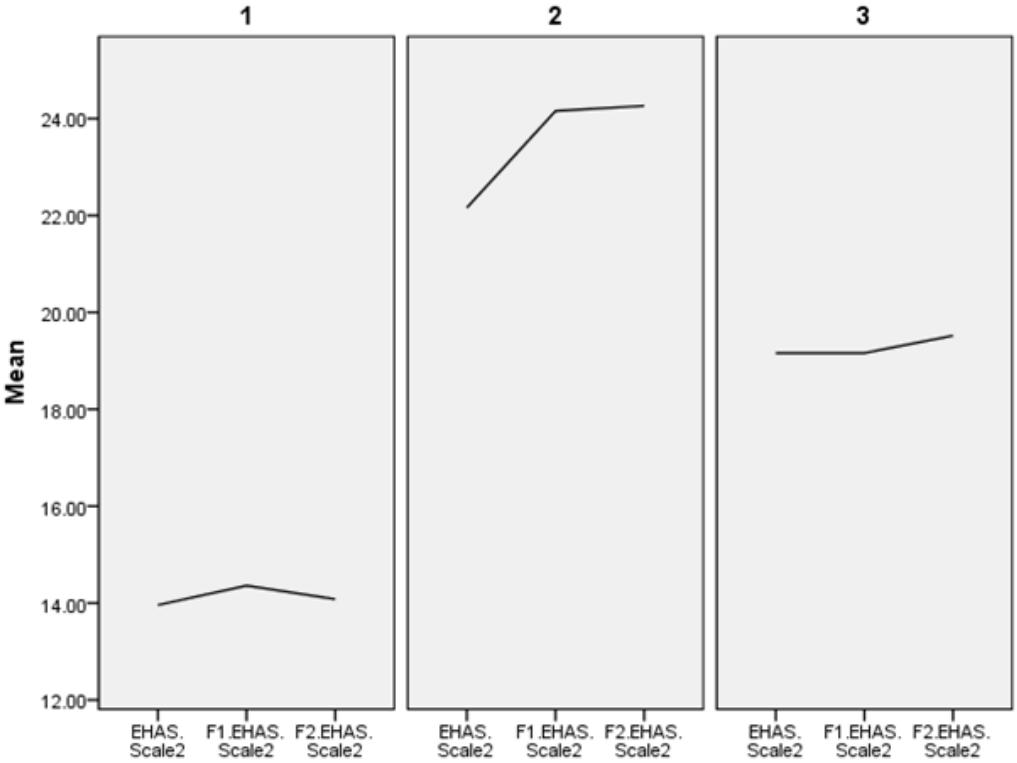

Figure 12. Mean of Scale 2 Scores for Each Cluster at Baseline, Follow-up 1, and Follow-up 2

Results also showed that the association between group membership and recidivism was approaching significance, χ^2 (2, N = 92) = 5.36, p = .07, and follow-up analyses demonstrated that this was due to the significant difference between the first and second groups, with the second group being significantly more likely to have recidivated during the follow-up period, χ^2 (1, N = 44) = 5.52, p < .05. These results were also consistent with expectations, as 8% (n = 2) of participants in Group 1 recidivated, while 37% (n = 7) of participants in Group 2 and 23% (n = 11) of participants in Group 3 recidivated.

3.10. Research Question 6: Can change be predicted by other, potentially relevant variables?

Chi-square and One-Way ANOVAs were conducted to determine whether group membership (i.e., groups of individuals with similar trajectories, as derived in the previous section) could be predicted by variables such as age, psychopathy scores, and treatment non-compliance.

Analyses for Total EHAS and Scale 1 scores demonstrated that group membership was not associated with age, psychopathy scores, and treatment non-compliance at any time during the follow-up. Results using Scale 2 demonstrated that there was a significant difference in age of participants based on group membership, F (2, 93) = 4.72, p < .05. Post-hoc analyses using a Tukey multiple comparison showed a significant difference in age between Group 1(i.e., low, stable scores) and Group 2 (i.e., higher, increasing scores), as well as between Group 1 and Group 3 (i.e., moderately high, stable scores). Specifically, individuals in Group 1 were found to be significantly younger than those in Group 2 (M_{diff} = 8.24, p < .05) and those in Group 3 (M_{diff} = 6.12, p < .05). Finally, results also showed that the association between group membership and treatment non-compliance during the first follow-up was approaching significance, χ^2 (2, N = 94) = 5.68, p = .06, and further analyses revealed that this was due to a significant difference between Group 1 and Group 2, with members of the second group exhibiting more treatment non-compliance, χ^2 (1, N = 44) = 4.23, p < .05, as well as a significant difference between Group 2 and Group 3, again with the second group being more likely

to have admitted to being non-compliant with treatment during the first follow-up period, χ^2 (1, N = 69) = 4.80, p < .05. There were no significant differences in psychopathy between groups.

Linear regression was used to determine whether psychopathy was a significant predictor of change scores (i.e., rather than group membership); in addition, *t*-tests were performed to examine whether individuals who were non-compliant differed significantly with respect to changes in EHAS scores over time. Results demonstrated that psychopathy accounted for a significant proportion of variance in changes in EHAS Total scores from baseline to follow-up 1 (see Table 12), and that this relationship was negative. In addition, psychopathy was a positive and significant predictor of changes in Scale 1 scores from follow-up 1 to follow-up 2, while changes in Scale 2 scores from baseline to follow-up 2 were negatively but significantly associated with psychopathy (see Tables 13 and 14, respectively). There were no associations between individuals who complied with treatment and those who were non-compliant with respect to changes in EHAS scores over time.

Table 12. Linear Regression Examining the Relationship Between Psychopathy and Changes in Total EHAS Scores Between Baseline and Follow-up 1

Variable	B	SE (B)	*β*	*t*	Sig.
Psychopathy					
(Constant)	-2.921	.679		-4.300	.000
Change EHAS Total	-2.600	1.109	-.209	-2.344	.021

Note. N = 121.

Table 13. Linear Regression Examining the Relationship Between Psychopathy and Changes in Scale 1 Scores Between Follow-up 1 and Follow-up 2

Variable	B	SE (B)	*β*	*t*	Sig.
Psychopathy					
(Constant)	.060	.545		.111	.912
Change in Scale 1	1.952	.892	.221	2.188	.031

Note. N = 94.

Table 14. Linear Regression Examining the Relationship Between Psychopathy and Changes in Scale 2 Scores Between Baseline and Follow-up 2

Variable	**B**	**SE (B)**	***β***	***t***	**Sig.**
Psychopathy					
(Constant)	.355	.364		.977	.331
Change in Scale 2	-1.188	.596	-.202	-1.993	.049

Note. *N* = 94.

4. Discussion

The purpose of this project was to determine whether the HAB, as measured by the EHAS, is a dynamic risk factor with respect to violence and recidivism. To this end, I examined the predictive validity of the EHAS vis-à-vis these outcomes, as well as whether changes in EHAS over time predict outcomes. I also aimed to explore whether and how much EHAS scores fluctuate over time, and whether certain groups of people show similar trajectories in EHAS scores. Lastly, I sought to determine whether individuals with similar trajectories were more likely to have engaged in negative outcomes, and whether certain variables could predict group membership. In line with Hendry (2009), I examined these hypotheses using both the EHAS and its conceptually-derived subscales (i.e., Scale 1 – Persecutory Delusions; Scale 2 – Attitudes toward Violence).

These results build on McNiel and colleagues' (2003) and Hendry's (2009) investigations of the EHAS in a number of ways. Specifically, while both the McNiel et al. and Hendry sample were comprised of civil psychiatric patients, this sample included criminal offenders in addition to civil psychiatric patients. In addition, the main focus of the aforementioned studies was on retrospective validity and predictive validity of the EHAS with respect to violence at one time-point (i.e., baseline), with one follow-up period. In contrast, this study examined the EHAS and violence as well as recidivism using a truly prospective design and measuring outcomes at multiple time-points, thereby allowing for the examination of short-term and long-term predictive validity analyses, as well as the exploration of any short-term changes in EHAS over time. Finally, to date no study involving the EHAS had examined its change over time at more than two time-points, its ability to classify groups of individuals with similar EHAS score trajectories over time, and whether psychopathy and non-compliance were related to different EHAS trajectories. This research study aimed to add to the literature on short-term changes in risk factors by examining trajectories in EHAS scores over three time-

points, using cluster analysis to classify individuals who show similar trajectories, and determining whether certain groups show higher rates of negative outcomes.

4.1. Psychometric Properties of the EHAS

In line with previous research (Hendry, 2009; Hendry & Douglas, 2012; McNiel et al., 2003), the EHAS was found to have good psychometric properties in this sample. Specifically, the EHAS had good internal consistency in civil psychiatric patients and criminal offenders at all three time points (range, α = .78 - .86), and results demonstrated a similar pattern for Scale 1 (range, α = .86 - .91). Results for Scale 2 were not as positive, with internal consistency ranging from poor to adequate (range, α = .49 - .77) (Nunnally & Bernstein, 1994). Internal consistency was similar across civil and criminal samples. In addition, while there were very strong intercorrelations between Total EHAS scores and Scale 1 scores (range, r = .88 – .91), the associations between Total EHAS and Scale 2 scores were not as strong, though still significant (range, r = .57 – .66) – this is consistent with previous research and may account for the similar patterns of findings of the Total and Scale 1 scores found in previous research (Hendry, 2009).

The fact that Scale 2 was found to have lower reliability than other scales is not uncommon for the EHAS, as previous research using this sample has found similar results, and although there is a possibility that the lower reliability may negatively impact its ability to detect associations between this scale and other variables, in the past Scale 2 has been found to be significantly associated with other variables in smaller samples despite the lower reliability (Hendry, 2009; Hendry & Douglas, 2012).

4.2. Research Question 1: Are scores on the EHAS predictive of violence and recidivism?

Logistic regression was performed to examine the association between the EHAS scores and outcomes. This was performed for EHAS Total scores as well as scale scores and, where relevant (i.e., recidivism and serious recidivism), the type of sample was used as a covariate. Total EHAS and Scale 1 (Persecutory Delusions)

scores at baseline were found to be significant predictors of Violence at follow-up 1, but not follow-up 2 or recidivism. Further, baseline Scale 2 (Attitudes toward Violence) scores were a significant predictor of recidivism but not violence, even after controlling for type of sample.

Although these results are only partially in line with the hypotheses, this is one of the first studies having demonstrated the predictive validity of the EHAS with respect to outcomes. Previous research by McNiel et al. (2003) found a significant association between the EHAS and violence; however, their study design was retrospective in nature. Hendry (2009) examined the relationship between the EHAS, its subscales, and violence during a 5-month follow-up period; results demonstrated that there was no significant relationship between the EHAS and violence during the follow-up period; however, this study was based on a smaller sample size and did not separate violence into different follow-up periods.

The result that baseline Total and Scale 1 scores were predictive of violence at the first follow-up, and that follow-up 1 Total EHAS scores were predictive of violence at follow-up 2 provides evidence to support the predictive validity of the EHAS over the short-term. It should be noted that EHAS scores were not predictive of violence at later follow-ups (e.g., baseline for follow-up 2) but rather were predictive of violence in the time period immediately following the initial interview (e.g., baseline for follow-up 1), which points to the short-term “shelf-life” of the HAB and relevance of monitoring HAB levels over time.

In line with Wilson and colleagues (2013), who found that dynamic factors were better predictors for shorter-term follow-up periods, the findings of this study provide evidence to support the recommendation of frequent re-assessment of dynamic risk factors. Whereas Wilson et al. had repeated measurements every three months, in this study it was possible to see a difference in predictive validity for a time period as short as four to six weeks for the HAB, thereby providing further evidence that risk assessments may only be valid for a short period of time after their completion. This has implications for clinicians responsible for the initial assessment and subsequent monitoring of individuals, as well as for researchers seeking to find the optimal amount

of time between repeated assessments of dynamic risk factors. This will be discussed further in the *Implications* section.

4.3. Research Question 2: Do EHAS scores change over time?

A number of different analyses were used to test whether the EHAS exhibited change over time; this was done using the complete sample as well as the two subsamples, to determine whether the functioning of the EHAS is generalizable. First, in the overall sample paired samples *t*-tests demonstrated that Total and Scale 1 scores significantly decreased between baseline and follow-up 1, but not between follow-up 1 and follow-up 2. Results of the *t*-tests using Scale 2 demonstrated no significant changes on this scale at any of the different time points. Results were very similar for the civil sample, where Total and Scale 1 scores showed a decrease between baseline and follow-up 1 before leveling off at follow-up 2. However, Scale 2 scores increased from baseline to follow-up 2, which was unexpected. Findings in the correctional sample were somewhat different, with only Scale 1 having significantly decreased over time from baseline to follow-up 1.

Test-retest reliability of the EHAS from baseline to follow-up 1, follow-up 1 to follow-up 2, and baseline to follow-up 2 was also examined. Analyses using the complete sample as well as separate samples showed that Scale 1 scores were typically more stable over time, and that Total EHAS and Scale 2 scores tended to be less stable. The coefficients obtained (range, r = .60 to .80) were, in most cases, below what is considered “acceptable” (Nunnally & Bernstein, 1994); however, the coefficients obtained in this study were consistent with previous research on hostile attributions in adults (e.g., Coccaro et al., 2009; Hendry & Douglas, 2010; Homant & Kennedy, 2003). In addition, given the hypothesis that the HAB is a dynamic risk factor, one would expect lower test-retest reliability due to changes in scores over time.

To determine whether the significant differences in EHAS scores over time were related to the pattern of missing data, analyses were performed to compare individuals who completed at least one follow-up to those who did not on a number of demographic

and clinical variables (i.e., age, gender, psychopathy, substance use, previous violence, previous involvement in the criminal justice system). Analyses demonstrated no significant differences between participants who completed a follow-up and those who did not on any of these variables in the combined as well as civil samples. In the correctional sample men were more likely to have completed a follow-up than females; however, none of the analyses performed on the correctional sample alone (i.e., RCI) needed to control for gender, and therefore no steps were taken to do so.

The findings of the current study are consistent with Hendry's (2009) sample of civil psychiatric patients, in which there was a significant decrease in Total and Scale 1 scores between baseline and follow-up 1, but no such decrease for Scale 2. However, this is the first investigation of the EHAS over time in criminal offenders and, as such, there is no available study for comparison.

Another way to determine whether EHAS scores change over time is to calculate the Reliable Change Index (RCI), which examines the extent to which participants' scores changed to determine whether the change can be considered "reliable" at an individual level, rather than simply statistically significant at an overall group level. Reliable Change Index analyses for the combined sample demonstrated that a small number of participants exhibited reliable change in Total EHAS and Scale 2 scores over the different time periods, whereas a larger number of individuals' scores changed on Scale 1, where a large number of individuals' scores decreased reliably from baseline to follow-up 1 and baseline to follow-up 2. Results were similar when examining the RCI in subsamples; in both cases, participants' Total and Scale 2 scores tended to be relatively stable, while Scale 1 scores tended to show more reliable change over time, with most participants exhibiting a decrease in scores over time.

The findings that larger proportions of individuals' scores changed reliably on Scale 1, and to a lesser extent Scale 2, add to the evidence supporting the two subscales of the EHAS, especially within a dynamic context. Total EHAS scores are useful but did not show as much change over time as the two subscales; this is potentially explained by different changes in Scale 1 and Scale 2 scores within the same time period. For instance, if Scale 1 scores increased but Scale 2 scores decreased, Total EHAS scores would remain relatively stable, and there would be no way of

determining whether this is due to changes in subscale scores. As such, examining the two scales, which may be tapping different constructs, can add to the clinical utility of this tool or other tools examining similar constructs.

Further, recent research measuring changes in risk factors, particularly criminal attitudes and thinking, have demonstrated similar results with respect to reliable change. In their study examining changes in federal offenders' criminal and antisocial attitudes following community-based CBT treatment, Kroner and Yessine (2013) found that only 4% to 14% of participants exhibited a reliable change in scores, depending on the scale. Similarly, results of the current study showed that, overall, the range of reliable *decrease* for Scale 2 (Attitudes toward Violence) was 0% to 17% in the criminal sample, and 4% to 7% in the civil sample, depending on the time period (i.e., baseline to follow-up 1, follow-up 1 to follow-up 2, and baseline to follow-up 2). Although the percentage of individuals showing a reliable decrease is comparable to the reliable change showed by Kroner and Yessine, it should be noted that a small proportion of individuals also showed a reliable *increase* over time. However, given that participants in the current sample were not receiving specific treatment targeting criminal attitudes, the finding that some individuals experienced an increase in scores is not unexpected, though it does point to the importance of targeted interventions.

Taken together, the results of the *t*-test and RCI analyses support the hypothesis that EHAS scores tend to change over time. The results show that, overall, EHAS scores tend to decrease over time (i.e., only 2% of individuals had a reliable increase in scores over the course of the study). As mentioned above, a decrease in EHAS scores (especially for Scale 1) over time was expected based on previous research (Hendry, 2009). Further, when examining the two subscales of the EHAS, the findings seem to be consistent with the *acute dynamic* and *stable dynamic* risk factor categories (Hanson & Harris, 2000). Specifically, Scale 1, which seems to measure psychotic symptoms, was found to demonstrate a higher degree of change (i.e., decrease) over time than Scale 2, which measures attitudes toward violence. Hanson and Harris (2000) mention that acute dynamic risk factors change more quickly than stable dynamic risk factors, which tend to be more trait-like. As such, it is possible that symptoms of psychosis may change more quickly than attitudes, which may take longer to improve.

If the HAB truly is a dynamic risk factor, it is worth considering what may be driving or causing the changes in scores over time. One possibility for this change over time is the severity of the symptoms that participants were suffering from at the beginning of the study. Civil psychiatric patients were recruited while they were still in the psychiatric ward of the hospital which, under Canadian civil commitment law, assumes a certain degree of impairment (e.g., Douglas & Koch, 2001); the rapid improvement in EHAS scores from the baseline interview to the first follow-up, especially with respect to Scale 1, may reflect a certain stabilization in their symptoms post-discharge from the psychiatric facility. In addition, given that all civil participants were receiving medication for mental health problems at baseline, it is possible that the reduction in the severity of psychotic symptoms was due to the medication or treatment received by participants upon discharge.

With respect to changes in EHAS scores in the criminal sample, some research in incarcerated youth (Butner, Loney, & Kistner, 2007) has demonstrated a substantive difference between measures of mental health-related difficulties between youths having been incarcerated for some time and youth having completed the measures at intake to probation or detention centers, suggesting that the initial stress of transitioning or transferring to institutions may have exacerbated scores on mental health measures. Therefore, it is possible that decreases in EHAS scores in the correctional sample are related to a decrease in stress over time, after having settled into a new routine. In addition, release from a correctional institution may have decreased the stress or fear associated with legitimate concerns in jail, such as being targeted by other offenders; these items are measured by Scale 1 of the EHAS.

The findings of this study can only speak to the changes in EHAS scores over time for civil psychiatric patients and criminal offenders attending treatment or community supervision. Therefore, it is impossible to know whether EHAS scores would decrease to a greater extent if participants had participated in a treatment study aiming to decrease the HAB; however, it would not be unreasonable to expect larger changes in EHAS scores in such contexts, given the available evidence demonstrating the effectiveness of such interventions in children and adults (e.g., Ashford et al., 2008; Hudley & Graham, 1993), as well as the “Need” component of the Risk-Need-Responsivity model (Andrews & Bonta, 1998, 2006) suggesting the importance of

targeting relevant criminogenic needs (also known as dynamic risk factors). The next step in determining the utility of measuring changes in risk factors is to examine whether changes in risk factors are related to outcomes, as this is the main goal of this line of research.

4.4. Research Question 3: Is the degree of change over time on the EHAS related to violence and recidivism?

The hypothesis that changes in EHAS scores over time are related to outcomes was examined using a number of different analyses; this was done to determine whether changes in EHAS scores over time are more valuable to examine than initial EHAS scores. Logistic regression was used to determine the predictive validity of changes in EHAS scores with respect to outcomes. Support for this hypothesis was not overwhelming, as results demonstrated only that changes in Scale 2 scores from baseline to follow-up 1 was a significant predictor of violence at follow-up 1; no other associations were uncovered.

The hypothesis was also tested by determining whether individuals who show a reliable increase or decrease on the RCI were more or less likely to recidivate or be violent. Results provided partial support for this hypothesis in the complete sample, with differences between individuals whose scores had reliably increased or decreased between baseline and follow-up 2 and their likelihood of violence at follow-up 2. Further, a significant difference was found between individuals whose scores had increased and those whose scores had not changed between baseline and follow-up 1, with respect to violence at follow-up 1. Finally, a significant difference was found in rates of recidivism and serious recidivism between individuals exhibiting no change and a decrease in scores between baseline and the first follow-up; however, this finding was in the unexpected direction, where individuals whose scores decreased over time were more likely to recidivate than individuals whose scores had not changed over time. This could mean, for example, that as participants' symptoms decreased, they were able to act in more purposive ways. Some evidence exists for a curvilinear relationship between psychosis and violence, where psychotic symptom severity is found to be positively

associated with violence, except in individuals with the greatest number of symptoms; in these individuals, violence risk was relatively low (e.g., they may have been too impaired to act) (Swanson et al., 1997). However, more research is needed on this topic.

Another way to determine whether the degree of change over time (categorically, as opposed to continuously) is related to outcomes is to divide the sample into groups and compare groups with respect to their extent of change and association with outcomes. To do so, the sample was divided into four equal groups (i.e., quartiles) on the basis of the degree of change shown, and these quartiles were compared against rates of outcomes for individuals. Results demonstrated a relationship between quartiles and outcomes between the 4th quartile of Scale 2 (i.e., the highest increase in scores) and violence at the first follow-up, suggesting that individuals whose scores had increased the most between baseline and follow-up 1 were more likely to have been violent during the first follow-up period compared to individuals in other quartiles. This suggests that individuals who exhibit the largest changes in scores, especially with respect to increases in negative attitudes pertaining to violence, are more likely to perpetrate violence in the near future; however, no such relationship was found for recidivism.

Lastly, to determine whether changes in EHAS scores could predict outcomes regardless of baseline scores, moderation analyses were used. These were done because change scores may be associated with a person's initial score (i.e., the association between changes in EHAS scores and outcomes might vary depending on the individual's baseline score); therefore, controlling for this initial score ensures that a significant association would be due to the change score itself, and not the initial score. Results showed that the interaction between original (i.e., baseline, follow-up 1) and change scores were not significant predictors of outcomes when controlling for original and change scores. Moreover, a subset of the analyses were performed to determine whether changes in EHAS scores from baseline to the first follow-up would add predictive validity above and beyond baseline scores; no significant associations were found. These findings demonstrate that the interaction between original and change scores do not add predictive value in such analyses, and that change scores do not add value above and beyond baseline scores. This suggests that original and changes in

EHAS scores could be (and some, in fact, are) predictive of outcomes without taking their baseline levels into consideration.

Overall, the results of this section provide some evidence for the association between changes in EHAS scores and outcomes. While not all associations were found to be significant, an association between changes in EHAS scores and violence and recidivism was demonstrated in different ways, therefore lending some support to the hypothesis linking EHAS changes and outcomes. Examining whether changes in dynamic risk factors are related to outcomes is a relatively new area of research, and as such to date very few studies have examined this issue, and fewer have examined risk factors related to the HAB. A large treatment study recently demonstrated very little association between intra-individual changes in criminal attitudes and future recidivism (Kroner & Yessine, 2013), and results from the Re-Entry: Dynamic Risk Assessment study have also failed to demonstrate a relationship between changes in dynamic risk factors and outcomes (Morgan et al., 2013). In addition, the recent review by Serin and colleagues (2013) included a number of studies having examined intra-individual changes in risk factors over time, and whether this change was related to recidivism. Similar to the results of the current study, the authors found inconsistent support for the relationship between changes in a number of risk factors and outcomes, with a large range of effect sizes (d = 0.06 to 1.48).

The existing literature combined with the current findings pertaining to changes in risk factors and outcomes do not point unanimously to the utility of using change as an important predictor of violence or recidivism over the short-term. These inconsistent findings have led some researchers to suggest that, given that decreases in risk factors have not been conclusively linked to a decrease in outcomes, criminal risk may not be a dynamic process but rather a static process, where individuals remain at their baseline levels of risk despite amelioration in the level of dynamic risk (Morgan et al., 2013). Although there is data showing that a decrease in dynamic risk factors does not necessarily result in a decrease in risk, the findings that dynamic risk factors are better predictors of outcomes over the short-term compared to the long-term (e.g., Wilson et al., 2013) suggest that changes in risk factors play a critical role in this process, and that further research must be undertaken to examine this topic. Additional studies are also

needed to determine whether there may be an optimal time frame for re-evaluation, which may then increase the utility of change scores.

4.5. Research Question 4: Are scores on the EHAS associated with time until violence or recidivism?

Cox Proportional Hazard Analysis examined whether EHAS scores were related to time until violence perpetration or recidivism. Results showed no significant relationship between EHAS scores and time until violence perpetration, but demonstrated a significant relationship between EHAS scores and recidivism; specifically, Scale 1 scores at follow-up 1 were significantly associated with time to recidivism and serious recidivism, even after controlling for the type of sample. Further, changes in Scale 1 scores from follow-up 1 to follow-up 2 was a significant predictor of time to recidivism; however, this direction of the association was unexpected. That is, decreases in Scale 1 scores over time were related to faster recidivism. Therefore, although there is some partial evidence supporting the association between the EHAS and time until outcomes, this association may be exclusive to recidivism and, based on these results, may be of limited use.

4.6. Research Question 5: Are there groups of individuals who show the same pattern of change over time and, if so, do these groups have different rates of violence and recidivism?

Cluster analysis was conducted to determine whether certain individuals showed similar trajectories of EHAS scores over time, and this was performed for Total and Scale scores. Results of the analyses for Total EHAS scores produced five clusters, meaning that five different groups of individuals showed similar trajectories over time. As seen in Figure 8, the five groups behaved quite differently from one another. While two groups (Groups 1 and 4) exhibited a similar trajectory in that they decreased and then increased slightly over time, one can see that those two groups of individuals had different levels of EHAS over time despite a similar trajectory. In addition, while Group 2

remained relatively stable, Group 3's scores started off low and increased at both follow-ups, and Group 5's baseline were higher but decreased over the two follow-up periods.

In addition to demonstrating that EHAS scores do change over time, the results underscore the importance of examining group trajectories and original levels of scores rather than only relying on change scores – that is, if only change scores were relied upon, it is possible that the distinction between Groups 2 and 4 may have been missed, as participants in both groups show a similar decrease and slight increase in scores. Analyses focusing solely on change scores would have missed the starting point (i.e., original score), which may be very relevant in clinical practice.

Next, the relationship between group membership (i.e., Group 1 to 5) and outcomes of interest was examined. No significant association between group membership and outcomes were found for Total EHAS scores. Although the results may suggest that dividing the sample into groups with different trajectories was not fruitful in terms of enhancing predictive validity of the Total EHAS scores, it is important to note that despite not being statistically significant, the results were in the expected direction. That is, rates of violence and recidivism tended to be higher for groups whose scores were either higher or increasing over time, and tended to be lower for groups whose scores were either lower or decreasing over time; because these analyses were performed with a smaller subset of the sample (i.e., those for whom data was collected at baseline, follow-up 1, and follow-up 2), it is possible that sample size may have played a role in these analyses not being statistically significant.

Cluster analysis was also performed using Scale 1 scores, to determine whether groups of individuals had similar trajectories over time. Results revealed a 3-cluster solution, where individuals in the first group had relatively low scores at baseline and showed a decrease in scores from baseline to follow-up 1, and then their scores leveled off at follow-up 2; the second group of individuals had low Scale 1 scores at all time points, whereas Group 3 had higher scores at baseline, dropped significantly at follow-up 1, and decreased slightly at follow-up 2. This is valuable information as it suggests that the largest drop in scores occurred from baseline to follow-up 1, as reported above using *t*-tests; however, Figure 10 demonstrates that this sharp decrease in scores from

baseline to follow-up does not occur for every participant but rather is limited to those in Groups 1 and 3.

Follow-up analyses comparing groups to the outcomes showed a significant difference between violence at the first and second follow-up was found between Group 2 and Group 3, with the third group being more violent than the second group, at both time points. When examining Figure 10, this finding suggests that individuals whose Scale 1 scores dropped at all time points are more likely to be violent, compared to participants whose scores remained stable over time. However, a closer look reveals the alternative possibility that despite a sharp decrease in EHAS scores over time, scores of participants in Group 3 were higher than those of participants in Group 2. In line with the findings for Total EHAS scores, examining the pattern of findings for the non-significant findings was found to be valuable with respect to trends in the data showing that rates of violence and recidivism differed based on group membership.

Lastly, a 3-cluster analysis was also found for the trajectories in Scale 2 scores over time. Groups 1 and 3 showed relatively little change over time, but started at different scores, such that Group 3 scores are higher than Group 1 scores. Scores of individuals in Group 2, however, increased after baseline, only to level off at the second follow-up. Follow-up analyses demonstrated a significant difference in age between groups, with Group 2 individuals being significantly younger than Groups 1 and 3.

With respect to outcomes, individuals in Group 2 were more likely to have been violent during the first follow-up period than individuals in other groups; similarly, the association between group membership and recidivism was marginally significant, with Group 2 being more likely to have recidivated during the follow-up period.

The finding that individuals in Group 2 were more likely to be violent and marginally more likely to recidivate are consistent with expectations. Given that Scale 2 is thought to measure attitudes toward violence, it is plausible to hypothesize that individuals who support the use of violence are more likely to be violent and recidivate. In addition, when only examining Group 2, it is evident that individuals in Group 2 exhibited an increase in Scale 2 scores at the beginning of the study, and that this

increase in scores was maintained throughout the study, making them more likely to engage in negative outcomes.

Again, an examination of the data suggests that, even when analyses were not statistically significant, there are important patterns in the data. For each of the analyses, rates of violence and recidivism were higher (albeit not significant) in Group 2 than other groups; as mentioned above, this is consistent with expectations as Scale 2 scores in Groups 1 and 3 are lower and decreasing over time, whereas Group 2 scores are higher and increasing over time.

Taken together, the results of the cluster analyses demonstrated that individuals followed several trajectories over time with respect to EHAS scores, and that these trajectories were different when considering Total, Scale 1, and Scale 2 scores. The results also demonstrated the utility of considering individuals' trajectories to conceptualize and manage risk, as specific trajectories were associated with a higher number of negative outcomes than others. It is possible that a higher number of statistically significant differences would have been found had the sample size been larger.

4.7. Research Question 6: Can change be predicted by other, potentially relevant variables?

After examining the link between group membership and outcomes, I examined whether certain variables of interest could predict group membership, and whether these variables could predict changes in EHAS scores. This was done in an effort to increase the research examining predictors of change; finding predictors of change and group membership can be useful in practice when determining what trajectory individuals will follow.

Results for Total and Scale 1 scores showed that group membership could not be predicted using age, psychopathy scores, and treatment non-compliance. With respect to Scale 2, no significant associations were uncovered for psychopathy, whereas there was a marginally significant relationship between group membership and treatment

compliance, where individuals in the second group were more likely not to comply with treatment than individuals in Group 1. Further, the findings showing that this second group was also the most non-compliant with treatment out of the three groups makes it even less surprising that they would have perpetrated violence and recidivated, as outlined in the previous section. However, the association between patterns of changes in EHAS scores and treatment non-compliance was inconsistent, which suggests that other variables may play a larger role in changing EHAS scores.

When psychopathy and changes in EHAS scores were treated as continuous variables (i.e., as opposed to categorically using clusters), results demonstrated that psychopathy was a significant predictor of changes in Total EHAS scores from baseline to follow-up 1 and Scale 2 scores from baseline to follow-up 2. Regression analyses showed a negative association between these variables, such that as psychopathy scores decrease, participants' change scores on the EHAS variables tended to increase (i.e., worsen); this was contrary to expectations, as it was expected that individuals lower on psychopathy would exhibit a decrease in scores over time, while those higher in psychopathic traits would show either no change or an increase in EHAS scores over time. An association in the expected direction was found for the association between psychopathy and changes in Scale 1 scores from follow-up 1 to follow-up 2, such that individuals higher in psychopathy were more likely to show higher increases in Scale 1 scores over time. It is important to note that findings of the association between psychopathy and changes in scores were inconsistent; only three associations proved to be significant, with two associations being in the unexpected directions. Further, in the analyses using groups derived through cluster analysis, psychopathy was not a significant predictor of group membership. Although it is possible that analyzing data of a categorical nature may have decreased power due to the categorization of a continuous variable (Aiken & West, 1991), a more plausible explanation is that these non-significant and inconsistent findings point to psychopathy not being a consistent predictor of changes in EHAS scores over time.

Given that psychopathy and treatment non-compliance were not conclusive predictors of change, it is important to consider alternative variables. In addition to some variables mentioned above (i.e., severity of symptoms, stress), another possibility is the extent of an individual's involvement in treatment. That is, rather than using a

dichotomous measure of compliance, future research should examine the relationship between changes in EHAS scores and quantitative and qualitative features of treatment, such as the nature and frequency of the treatment. Further, the effect of variables such as therapeutic alliance or perceived coercion for psychiatric treatment on changes in EHAS scores should be examined. The link between changes in EHAS scores and these variables was not examined in this study as it was outside the scope of this project.

4.8. Is the HAB a Dynamic Risk Factor?

This study set out to explore whether the HAB, as measured by the EHAS, is a dynamic risk factor in the prediction of violence and recidivism in civil psychiatric patients and criminal offenders. As mentioned above, causal dynamic risk factors possess three components: they "precede and increase the likelihood of violence (i.e., be a risk factor), change spontaneously or through intervention (i.e., be a dynamic factor), and predict changes in the likelihood of violence when altered (i.e., be a causal dynamic risk factor)" (Douglas & Skeem, 2005, p.351). The extent to which the EHAS met these criteria is explored.

On the whole, the findings of this study partially support the use of the HAB, as measured by the EHAS, as a dynamic risk factor to predict violence and recidivism in these samples. The first criterion in examining causal dynamic risk factor is exploring whether the variable is a risk factor, or whether it will precede and increase the likelihood of the outcome (Douglas & Skeem, 2005). In this case, there is some evidence to support the statement that the EHAS was a risk factor for violence and recidivism. Specifically, a number of analyses (i.e., logistic regression, hierarchical regression) demonstrated that the EHAS and its subscales were significant predictors of violence and recidivism. In further support of the EHAS being a risk factor, most of the significant analyses revealed associations in the short-term, while most of the analyses examining the predictive validity of the EHAS over a longer time-period (e.g., violence 2 or more months post-assessment) were non-significant. To provide a concrete example, it was not unusual for baseline EHAS scores to predict violence at the first follow-up; however, few analyses found significant relationship between baseline EHAS scores and violence

at the second follow-up, or violence at any time after the assessment (i.e., aggregate variable measuring violence from follow-up 1 through follow-up 5). Despite these promising results, it should be noted that a number of analyses failed to find an association between the EHAS and outcomes; as such, this criterion is, at best, only partially supported.

The second criterion by which to evaluate a causal dynamic risk factor is to examine whether the variable or tool is dynamic; that is, does it change over time (Douglas & Skeem, 2005)? Most of the analyses conducted in the present study support the HAB, as measured by the EHAS, as being dynamic. For instance, there was a significant difference between Total EHAS and Scale 1 scores between baseline and follow-up 1, with EHAS scores decreasing significantly over time. Further, analyses using the RCI demonstrated that individuals' scores exhibited reliable change, but only in a few instances. Lastly, the findings from cluster analysis revealed a number of trajectories of EHAS scores over time for participants when examining total as well as Scale 1 and Scale 2 scores, providing further evidence to support its dynamic nature. However, given the inconsistent nature of the findings related to this criterion, the results should be interpreted with caution.

The third criterion to consider is whether the variable of interest can change the likelihood of outcomes when it is altered; that is, do changes in scores predict outcome. Again, the findings of this study partially support this criterion; in some analyses, the changes in scores over time were significant predictors of outcomes, but in most cases, change did not predict outcomes. This was true when exploring the predictive validity of change scores, when examining RCI scores and outcomes, and when taking into consideration results from Cox regression. Further, when splitting the sample into quartiles based on changes in EHAS scores over time, results demonstrated that individuals whose EHAS scores increased the most over time were more likely to have engaged in harmful behaviours during the follow-up period; however, while some analyses emerged as significant, many of them did not. Lastly, though not examining the third criterion directly, the results showing that different trajectories of EHAS scores over time result in different likelihood of outcomes provides indirect and partial support for this criterion.

Taken together, these findings only partially support the use of the EHAS as a dynamic risk factor with respect to adverse outcomes. In this study, the EHAS was shown to exhibit a lot of variability with respect to the EHAS being predictive of outcomes, to change over time, and its changes in scores over time were also found to be predictive of outcomes. Although the results of a number of analyses supported the hypotheses and provided initial evidence for the dynamic nature of the HAB, a number of other analyses failed to support the hypotheses.

4.9. Implications

The findings of the present study have significant clinical and research implications. Given the increasing reliance on clinicians to conduct risk assessments as well as the important personal and societal impact of the assessment of risk, the identification of relevant risk factors that should be included in these evaluations is paramount. This study highlights one specific dynamic risk factor which typically is not included, or is only indirectly included (i.e., falls under another, larger risk factor), in most risk assessment instruments used clinically. Therefore, the findings of this study add to the existing evidence suggesting that the HAB is an important risk factor to consider in risk assessment and risk management of civil psychiatric patients and criminal offenders, as doing so may increase the predictive accuracy of one's evaluation.

One major consideration resulting from this study and other recent investigations (e.g., Douglas et al., 2011; Wilson et al., 2013) is the time-limited nature of risk assessments, as well as its effects on the management of risk. Clinically, this could mean introducing government policy requiring institutions to decrease the amount of time between mandatory periodic reviews (e.g., 12 months in the case of individuals found Not Criminally Responsible on Account of Mental Disorder; *Criminal Code of Canada,* 1985; 24 months for federally incarcerated offenders, Correctional Service Canada, 2012), or requiring that more frequent risk assessments be done by clinicians in outpatient settings. Reducing the length of time between assessments would provide clinicians with more recent information pertaining to important risk factors, thereby allowing for better management of risk and reduction in outcomes. Increasing the

frequency with which risk factors are measured would also be of benefit to researchers, who are still searching for an optimal amount of time elapsed between assessments.

The results also point to the benefits of monitoring the levels of (and changes in) the HAB over time, as these may be indicative of an upcoming adverse event. Although thus far the evidence for a relationship between intra-individual changes in risk factors and outcomes is inconsistent, there is evidence that the HAB and other risk factors do change over time. Further, the finding that risk assessments seem to be time-limited provides additional evidence supporting additional work in this area. As such, monitoring these changes in clinical and research settings may lead to important conclusions or recommendations in the future.

With respect to the HAB specifically, the monitoring of this risk factor over time by clinicians may facilitate a patient's or offender's referral to programs or interventions targeted at reducing dynamic risk factors; the fact that the HAB was found to change over time in the current study makes it an ideal candidate for psychoeducational and cognitive-behavioural therapy-based (CBT) interventions. At this time, a number of available cognitive-behavioural strategies can be modified to target dynamic risk factors, and many tend to be offered in inpatient and outpatient contexts. Most of these strategies focus on recognizing the link between an individual's thoughts, emotions, and behaviours (e.g., Beck, 1995); these strategies lend themselves well to the HAB, where an error in thinking often leads to a negative emotion (e.g., anger), which results in a behaviour such as violence or recidivism.

This study suggests that lower levels of HAB may be beneficial in keeping individuals free of negative outcomes; as such, the findings of the current study highlight the need for programs and interventions targeting hostile attributions specifically, which could include skills such as problem-solving, challenging distorted thoughts (e.g., overgeneralization, polarized thinking, jumping to conclusions), recognizing triggers, and strategies to regulate one's emotions. Although these strategies have been implemented to various degrees in some programs (e.g., Ashford et al., 2008), more interventions should address the HAB specifically and should be more widely available to patients and offenders.

To maximize treatment engagement, the services offered should take into account patient and inmate preferences and perceptions. Specifically, research in inmate populations has found that offenders tend to prefer individual therapy to group therapy (Morgan, Rozycki, & Wilson, 2004), and that a number of barriers to treatment exist in individuals with mental health concerns, such as the knowledge of when and how to access services, concerns over reputation, and issues surrounding the confidentiality of mental health services (Morgan, Steffan, Shaw, & Wilson, 2007). Although these concerns should be addressed in all settings, they are of particular importance in individuals with higher levels of the HAB. Given their propensity to be suspicious of others' intentions toward them, individuals high in HAB may be especially distrustful of mental health services, treatment providers, and other patients or inmates. Therefore, developing programs and procedures which take these factors into consideration may increase the likelihood of patients and offenders seeking treatment on their own.

4.10. Strengths and Limitations

This research project had a number of strengths which should be mentioned. This study was prospective in nature and was the first study of the EHAS in criminal offenders, and the first to examine its predictive validity with respect to recidivism among psychiatric patients and offenders. Further, while previous research has examined the relationship between the EHAS and violence perpetration, this is the first study to examine the relationship between these two variables over the short-term (e.g., baseline predicting violence at first follow-up; scores at follow-up 1 predicting violence at follow-up 2) as well as long-term (i.e., violence at any time during the follow-up period), and the first study to explore whether *changes* in EHAS scores are predictive of outcomes.

In addition, this is one of the first studies to examine the trajectories of a risk factor over time, and the first multiple time-point investigation of changes in EHAS. As mentioned in the *Introduction*, the use of multiple time-points rather than single or dual time-point estimates is a significant strength as it allows for the examination of change which may not be linear over time (e.g., Douglas & Skeem, 2005). An additional advancement of research for the field was the ability to investigate whether certain

individuals had similar patterns of EHAS scores over time, and whether these patterns were related to outcomes as well as other variables such as psychopathy and treatment compliance.

The participants in this study were civil psychiatric patients who had just been discharged from the hospital, as well as criminal offenders who were on probation or had just been released from jail. Therefore, the results of this study are directly relevant to such clinical populations, and the inclusion of both samples allowed, to some extent, for an examination of the results in both samples separately. In addition, rather than relying solely on self-report data, the research protocol benefited from multiple sources of data, such as rehospitalization records and probation notes when available, as well as official recidivism data.

Finally, another strength of this study was that the use of conceptually-derived scales of the EHAS in addition to Total EHAS scores. Considering both subscales, which are thought to measure persecutory delusions and attitudes toward violence, was beneficial in its ability to pinpoint exactly which facet of the EHAS was contributing to the significance of analyses. In addition, the inclusion of the subscales in the analyses allowed for the discovery of some important associations which may have been missed if only the Total scores had been considered, given that scores on Scales 1 and 2 may both change over time while leaving the Total score relatively unchanged (e.g., Scale 1 decreases but Scale 2 increases, but the Total score remains the same). The fact that Scales 1 and 2 may change despite Total scores not changing points to the EHAS being a dynamic measure.

This study was not without its limitations. First, while this study was able to gather information from multiple sources, much of the data was obtained through patients' and offenders' self-reports. This can be problematic for a variety of situations, such as participants being poor historians or responding in a socially desirable manner, therefore calling into question the validity of their responses, especially when multiple sources of data were not available for these variables. For instance, research has suggested that response biases, such as defensive responding, deceitfulness, and poor insight tends to be associated with history of antisocial behaviour (e.g., Lilienfeld & Andrews, 1996; Loney & Counts, 2005).

As mentioned above, every effort was made to obtain additional sources of data when available, such as probation officers' and clinicians' progress notes, information pertaining to re-hospitalization or re-incarceration during the study follow-up period, and official records. However, it was not possible to obtain such data for all participants. For instance, a number of participants formally withdrew their participation in the study (as opposed to being lost), and as such formal criminal data was not available for these cases (*n* = 16; 9%). In addition, re-hospitalization data was obtained for civil psychiatric patients having been re-admitted to Royal Columbian Hospital after the beginning of their involvement in the study. In this case, it is impossible to know whether participants had been admitted to other hospitals with psychiatric wards in the region (e.g., Burnaby General Hospital, Surrey Memorial Hospital), although Fraser Health Authority officials have reported that, space permitting, individuals in need of rehospitalization typically return to the facility at which they were previously hospitalized (K. Douglas, personal communication, May 28, 2013).

Another limitation of this study was the attrition of participants. While this is not uncommon of longitudinal studies in this population (e.g., Steadman et al., 1998), it is possible that due to the extent of missing data in this sample, the findings may not be representative of all psychiatric patients and criminal offenders, thereby affecting the generalizability of the results. Further, the rate of missing data, especially with respect to follow-ups 3 (i.e., 48% attrition) through 5 (57% attrition), impacted the number of follow-ups used in this study. Although it would have been ideal to make use of all 5 follow-ups to explore changes in and trajectories of the EHAS over a longer period of time, this was not possible for the current study. As a way to deal with the missing values, multiple imputation was tested but ultimately not used; due to the high rates of attrition, imputation of data was not possible without inflated error rates leading to non-significant findings across all analyses.

Although the sample size (*N* = 174) was adequate to detect significant associations between the EHAS and outcomes of interest, the sub-sample of 56 offenders was too small to perform all analyses solely in this sample (e.g., cluster analyses for trajectories). However, "type of sample" was used as a covariate when applicable, which allowed me to control for this in regression analyses. Another issue which merits discussion is the wide range related to the number of days between follow-

ups. Due to the high variation in number of days between assessments for some participants, it is possible that, in some cases, a participant's time between the baseline interview and their second follow-up may have been shorter than the time elapsed between another person's baseline interview and first follow-up. While this may introduce some challenges with respect to the interpretation of the short-term vs. long-term prediction of violence and recidivism, due to the more longitudinal types of analyses (i.e., cluster analysis), it was considered essential to treat the follow-ups this way in order to maximize the number of participants having completed the first and second follow-ups.

Lastly, based on this investigation, it is impossible to know which construct was measured in this study. While the EHAS purports to measure the HAB (McNiel et al., 2003), to date very little research has examined the relationship between the EHAS and other measures of the HAB. In one study of 300 undergraduate participants, Hendry, Michal, and Douglas (2011) found a small-to-moderate association between the EHAS and scores on the Ambiguous Intention Hostility Questionnaire (AIHQ; Combs, Penn, Wicher, & Waldheter, 2007), which is a new measure of hostile socio-cognitive biases that is being increasingly used in HAB research. To date, no research has investigated the relationship between the EHAS and other measures of HAB, or attributional style, in clinical samples. Finally, while this project examined the relationship between outcomes and various EHAS scores, it is important to note that the factor structure of the EHAS has never been empirically investigated in clinical samples.

4.11. Directions for Future Research

While this study aimed to address a number of gaps surrounding the EHAS and the HAB in the literature, future research focusing on this variable is still needed. Specifically, additional research investigating the relationship between the EHAS and other measures of HAB in clinical samples is essential, as this has yet to be examined. Further, the factor structure of the EHAS should be investigated in clinical settings with larger sample sizes, to explore or confirm the current conceptually-derived subscales.

There continues to be a need for longitudinal research in clinical populations, and criminal populations more specifically, focusing on multiple measurements of dynamic risk factors. While this study addressed this issue, similar studies should be conducted with larger sample sizes and with a higher number of follow-ups to examine the trajectories of risk factors over longer time periods. As well, research examining risk factors at shorter intervals (e.g., daily or weekly rather than monthly) may shed more light on the trajectories of these risk factors. In addition to providing information about the nature and course of changes in risk factors, such investigations would also allow for research looking into predictors of change in dynamic risk factors.

Finally, given the evidence supporting the EHAS as a dynamic measure of HAB, future research should also make use of the EHAS in intervention research. A study similar to Ashford et al. (2008), where authors examined the effectiveness of a cognitive skills program with respect to reducing criminal attitudes and HAB in mentally ill offenders, could be implemented in other psychiatric and offender populations. The EHAS would lend itself well to such an investigation given the evidence supporting its dynamic nature, as well as the two subscales measuring persecutory delusions and attitudes toward violence.

4.12. Conclusion

This study examined whether the HAB, as measured by the EHAS, could be considered a dynamic risk factor with respect to violence and recidivism in civil psychiatric patients and criminal offenders. Overall the findings from the current study only partially support the use of the EHAS as a dynamic risk factor. While the EHAS was found to be a significant predictor of outcomes, was found to change over time, and its changes over time were related to future adverse outcomes in some analyses, it is also the case that the results were at times inconsistent and variable. Despite this, the results of this study underscore the importance of including the HAB as part of regular risk assessments and risk management plans. The current findings specifically point to the inclusion of cognitive skills training program in existing interventions targeted at reducing the HAB, given its potential to change over time. While this study clarified a number of important questions, more research needs to be conducted before clinicians and

researchers have a better understanding of the interplay between static and dynamic risk factors.

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