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Predicting Short-Term Violence Among Forensic Inpatients.

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UMI
PREDICTING SHORT-TERM VIOLENCE AMONG FORENSIC INPATIENTS

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in

The Department of Psychology

by

Mac Marcantel Martin
B.S., Oklahoma State University, 1995
M.A., Louisiana State University, 1998
December 2001

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Dedication

To my family. Most of all to Amber, my inspiration, who waited a lifetime for her mother to finish school. To James, my best friend and advisor in all things (especially statistics). To Victoria, for renewing my spirit, then stomping on it with tiny feet. And to my father, Jessie, for telling me that I could do anything in life if I held my tongue right, and for believing in me.
Acknowledgments

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Abstract

Legal reforms initiated in 1975 led to an increasing reliance upon mental health professionals to make predictions concerning violent behavior among the mentally ill, giving way to a series of violence prediction studies. However, these studies were noted to have major limitations, including unacceptably low rates of correct classification, high rates of misclassification, use of static, unavailable, or impractical predictors, and failure to cross-validate findings. Further, the bulk of these studies focused on predicting post-hospitalization violence, as opposed to inpatient violence, which can have important ramifications in treatment settings. The current study therefore examined the ability of forensic patients' current self-report on theoretically relevant and readily available variables (i.e., anger, psychotic symptoms, moral associations, self-esteem, attributional style, IQ) to postdictively discriminate among patients who committed a violent act ($N = 40$) and did not commit a violent act ($N = 40$) during the first 2 weeks of admission. By using all of the identified predictors, a true positive rate of 72.5% and true negative rate of 70% was obtained. Applying these results to a separate sample of newly admitted patients (prediction phase), it was
found that 87.5% were correctly predicted to engage in violent behavior, with 75% correctly predicted to not engage in violent behavior during the first 2 weeks of admission. Applying recommended criteria for computing validity and efficacy using local base rates, it was found that the resulting prediction scheme was both valid and effective at predicting violent behavior during the first 2 weeks of hospitalization. Moreover, it was found that the presence of hallucinations, patients' self-report of anger (decreased control and proneness to expression), and nature of commitment charge were of relatively greater importance in discriminating violent from nonviolent patients. The implications of these findings are discussed in relation to noted shortcomings of the study, therapeutic interventions for this population, and future prediction studies of violent behavior.
**Introduction**

The reliance on mental health professionals to predict violent behavior, or dangerousness, evolved largely in response to changes in criteria for civil commitment (Monahan, 1988; Mulvey & Lidz, 1985). Specifically, the reforms brought about by O’Connor v. Donaldson (1975) resulted in the incorporation of violence prediction as a determinant for whether or not a person should be civilly committed. Although civil commitment constitutes the vast majority of predictions of dangerous behavior (Otto, 1992), such predictions are also relevant to decisions in capital offense cases (Shah, 1981).

Predictions about violent behavior have come to play an increasingly important role in a variety of legal contexts. Shah (1978a, p.225) provided a comprehensive list of points throughout the legal process at which estimates of future harmful conduct are taken. This list remains applicable under most federal laws:

1. Decisions concerning bail, or release on personal recognizance for persons accused of crimes, including the level at which the bail is to be set.
2. Decisions concerning the waiver to adult courts of juveniles charged with serious crimes.

3. Sentencing decisions following criminal convictions, including decisions about release on conditions of probation.

4. Decisions pertaining to work-release and furlough programs for incarcerated offenders.

5. Parole and other conditional release decisions for offenders.


7. Determinations of dangerousness for all indicted felony defendants found incompetent to stand trial.

8. Decisions pertaining to the special handling of and transfer to special prisons of offenders who are disruptive in regular prisons.

9. Commitment of drug addicts (because of fears that they will commit violent crimes to support their drug habit).

10. Decisions concerning the emergency and long-term involuntary commitment of mentally ill
persons considered to pose a "danger to self or others."

11. Decisions concerning the "conditional" and "unconditional" release of involuntarily confined mental patients.

12. Decisions concerning the hospitalization (on grounds of continuing mental disorder and dangerousness) of persons acquitted by reason of insanity.

13. Decisions regarding the transfer to security hospitals of mental patients found to be too difficult or dangerous to be handled in regular civil mental hospitals.

14. Decisions concerning the invocation of special legal proceedings or sentencing provision for "habitual" and "dangerous" offenders.

15. Decisions concerning the likelihood of continued dangerousness of persons convicted of capital crimes, as a basis for determination regarding the use of the death sentence.

In the following sections, relevant research in the area of violence prediction will be reviewed. This will include investigations of both clinical and experimental
prediction studies of violent behavior among mentally ill persons, conducted in a variety of settings and across varying time spans. This will be followed by a discussion of the noted criticisms of the research in this area, along with identified factors that may prove useful in developing violence prediction schemes. A new study incorporating these factors into a pre- and post-prediction experimental investigation of violent behavior among forensic inpatients will be presented, along with a discussion of current findings as applied to clinical issues in predicting violent behavior.
Issues in Defining Dangerousness and Violence

One of the salient obstacles facing violence prediction as a whole is a massive inability among both researchers and mental health professionals to come to a cohesive (both inclusive and exclusive) definition of dangerousness as a construct (Monahan, 1981; Otto, 1992). If the definition most compatible to that of the legal system is considered, Otto's (1992) adoption of a broad definition of dangerous behavior including (a) physical violence directed against self or others, or (b) threats of physical violence or other intimidating behavior directed against self or others, seems most appropriate. However, agreement on exactly what constitutes violence or dangerousness beyond the obvious (e.g., being shot, stabbed, or punched) remains elusive (Monahan, 1981).

Violence or dangerousness is often defined in terms of the target of the action or the action itself. For example, Rubin (1972) included in the definition of violence only injury or death to persons, while Mulville and Tumin (1969) included the destruction of property in their definition of violence. Ervin and Lion (1969) suggested that violent thoughts constituted dangerousness because they had the potential to be acted upon.
Similarly, the federal government has presented a variety of views on violence and dangerousness. The Model Sentencing Act (National Council on Crime and Delinquency, 1973) described dangerous offenders as falling into one of two types. In the first type, the offender has committed a serious crime against a person and shown a behavior pattern of persistent assaultiveness based on serious mental disturbance. The second type described offenders who are deeply involved in organized crime. The National Commission on the Causes and Prevention of Violence defined violence as any overtly threatened or overtly accomplished application of force which results in the injury or destruction of persons or property or reputation, or the illegal appropriation of property (Mulvihill & Tumin, 1969). However, it has been noted that this definition would include accidental homicide and football injuries (Megargee, 1969).

Megargee (1969) pointed out two issues contributing to difficulties in establishing an acceptable operational definition of violence. First, if one focuses on the act itself instead of the legality of the act in context, some legal injuries would be characterized as violent (e.g., an injury sustained on the football field).
However, focusing on the legality alone is not much better. In that case, some activities that are (or were) considered legal would be characterized as nonviolent (e.g. the activities of the Nazi genocidists). Second, the question of intentionality deserves attention. Most definitions include only intentional acts. This is disputed by mental health professionals holding psychoanalytical views, (Monahan, 1981), who tend to infer intentionality on “unintentional” actions based on drives that are subconscious or unconscious. As the accuracy of determining intentionality beyond self report is not addressed in violence prediction literature, and is beyond the scope of this investigation, self reported intentionality will be accepted in determining between violent acts that are intentional versus accidental.

Problems in defining “dangerousness” as a construct are rooted in the concept itself. Monahan (1981) pointed out that, as a term, dangerousness is “unavoidably vague.” The word itself is vulnerable to being mistaken for a personality trait rather than a characteristic of behavior that is expressed as a probability in predicting behavior. In keeping with Scott’s (1977) conclusions that current available definitions were utterly
unacceptable, Monahan avoids using the characterization completely. He instead relies on a definition of violent behavior presented by Megargee (1976), which describes acts characterized by the application or overt threat of force which are likely to result in injury to people. This definition assumes injury to be physical in nature and includes the notion of threat. Because it is most in congruence with violent behavior as defined by the majority of previous research, and is acceptable in predicting violent behavior in most courts of law (Monahan, 1981), Megargee's definition was used in the present study.
Review of First Generation Research

Five outcome studies involving clinical prediction compose the majority of what is considered "first generation" research on predicting violence. These studies, published between 1972 and 1979, are among the first attempts to validate the ability of mental health professionals to predict violent behavior. Their findings, while disheartening, are summarized in Table 1.

Table 1

Validity Studies of the Clinical Prediction of Violent Behavior

<table>
<thead>
<tr>
<th>Study</th>
<th>% True Positive</th>
<th>% False Positive</th>
<th>% True Negative</th>
<th>% False Negative</th>
<th>Follow Up in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kozol et al (1972) N = 435</td>
<td>34.7</td>
<td>65.3</td>
<td>92.0</td>
<td>8.0</td>
<td>5</td>
</tr>
<tr>
<td>Steadman &amp; Cocozza (1974) N = 967</td>
<td>20.0</td>
<td>80.0</td>
<td>----</td>
<td>----</td>
<td>4</td>
</tr>
<tr>
<td>Cocozza &amp; Steadman (1976) N = 257</td>
<td>14.0</td>
<td>86.0</td>
<td>84.0</td>
<td>16.0</td>
<td>3</td>
</tr>
<tr>
<td>Steadman (1977) N = 152</td>
<td>41.3</td>
<td>58.7</td>
<td>68.8</td>
<td>31.2</td>
<td>3</td>
</tr>
<tr>
<td>Thornberry &amp; Jacoby (1979) N = 438</td>
<td>14.0</td>
<td>86.0</td>
<td>----</td>
<td>----</td>
<td>4</td>
</tr>
</tbody>
</table>

In the first study, Kozol, Boucher, and Garofalo (1972) reported a 10-year investigation of 592 male offenders. Clinical examinations, full psychological
test battery, and life history from a wide variety of sources composed the database for predicting violence. During the 5-year follow-up, Kozol et al. erred in two out of three predictions of violence (either false positives or false negatives).

A similar investigation was conducted at the Patuxet Institution in Maryland (Steadman, 1977). It was found that of those patients released with and without staff approval, 31% of those predicted to be nondangerous were arrested for a violent crime during a 3-year follow up. This stood in comparison to 41% of those judged by staff to be dangerous but released by the courts. However, this difference is much less impressive than the 32 and 39% difference reported in earlier research by the institution itself (1973) based on data from its first 10 years of operation.

In 1966, nearly 1,000 patients in a hospital for the criminally insane were transferred to civil mental hospitals under a U.S. Supreme Court decision (Baxtrom v. Herold, 1966). Follow up on these patients, all of whom had been predicted to be violent, was reported by Steadman and Cocozza (1974). It was found that only 20%
of these patients were assaultive during the 4 years of follow-up.

The Baxtrom decision resulted in a similar release of 438 patients in Pennsylvania. Of those, only 14% were discovered to have engaged in behaviors resulting in injury to other persons during the 4 years after release into the community (Thornberry & Jacoby, 1979).

In 1976, Cocozza and Steadman followed 257 indicted felony defendants found incompetent to stand trial in New York. After being examined by two psychiatrists, 60% were predicted to be dangerous and 40% nondangerous. During the 3-year follow up, only 14% of the dangerous group was rearrested for violent offences, compared to 16% of those deemed nondangerous.

Three major criticisms have been aimed at the first generation of validity studies on violence prediction (Monahan, 1981). The first criticism is that these studies were not actually testing predictive accuracy. Instead, they were measuring other things such as treatment effects or "bureaucratic inertia." For example, Stone (1975) suggested that predictions of violence might be made to enable involuntary treatment, and as such are nothing more than statements of
bureaucratic power. A second criticism is that it is not a fair test of predictive accuracy to measure violent behavior after a prolonged period of preventive institutionalization. In defense of the studies, Monahan pointed out that the predictions tested were those made immediately prior to release, not those resulting in the original institutionalization. Finally, a third criticism is that many of the people who had shown up in the research as false positives might actually have been committing violent behavior but had not yet been caught. While this might indeed have been the case, statistical correction is inappropriate without better knowledge of the base rates of occurrences and reportings of violent acts within the population studied.

In his review of these studies, Monahan (1981) summarized four points of similarity: (a) The individuals were institutionalized (b) In the institution, predictions were made that a group of these individuals would be violent if released into the community (c) The group predicted to be violent was monitored for a number of years in the community on its actual performance of violent behavior, and (d) Low frequencies of violent behavior were recorded, thus revealing the inaccuracy of
the predictions. These similarities limit the external validity of the research in that generalizability is necessarily limited to similar situations and excludes such scenarios as prediction of imminent violence in emergency contexts.

In conclusion, Monahan (1981) stated that only one out of every three predictions of violent behavior made by psychiatrists and psychologists were accurate. However, short-term prediction in emergency situations might prove somewhat better. Despite that exception, many interpreted Monahan's findings as summarily denouncing psychiatrists' and psychologists' ability to predict violence or dangerous behavior regardless of the context or situation (Otto, 1992).
The Issue of Base Rates

Monahan (1981) cited the most common and significant error made by clinicians in predicting violent behavior as ignoring information regarding the statistical base rate of violence within the population under study. Within this context, the term "base rate" simply refers to the frequency of occurrence of a specified type of violent behavior within a given population over a given time period. Otto (1992) recognized two important reasons for identifying the base rate of violent behavior among the mentally ill.

First, one method of determining whether a predictive technique is accurate is to compare the true positive rate (or hit rate) to the base rate. If the true positive rate exceeds the base rate, then the technique is considered valid. However, the frequency of the behavior also needs to be taken into consideration. Behavior occurring at a low frequency (a low base rate condition) is much more difficult to predict than high base rate behavior, as there occurs an increase in the number of opportunities for false positives to be identified (Meehl & Rosen, 1955). As such, Hanley (1979) pointed out that the ideal population on which to apply
clinical predictions of violence is one with a base rate of 50%, as the potential effect of the prediction in distinguishing the violent from the nonviolent would be maximized.

Second, knowledge of base rates is important to clinical predictions of violent behavior in that knowing and integrating this information into the prediction process can aid in determining the overall accuracy and effectiveness of such predictions. However, in some cases overall accuracy may be deemed less important than the "weight" given to case specific information in clinical prediction (Kahneman & Tversky, 1973). Specifically, Kahneman and Tversky found that people ignored base rates when case specific information was present, even when that information was identified as unreliable. Conversely, when case specific information was not available, people reverted back to reliance on base rate information.

As previously mentioned, the term base rate refers to the established prevalence of a specified type of violent behavior within a given population over a given time period. However, varying base rates can be identified depending upon how one chooses to define or
specify violent behavior. This is especially problematic, given the aforementioned problems concerning lack of an agreed upon definition for violence among investigators. Moreover, varying rates may also be identified depending upon the population or setting chosen for study. It is further noted that the time period used in most studies has varied considerably, ranging from a period of days or weeks to several years (Borum, 1996; Monahan, 1981).

Early research estimated the base rate of violence among the mentally ill by examining incidences of arrest for violent crime. These rates were found to range between 2 to 5% during a 1-year follow-up period, and are considered fairly low (Hiday, 1992; Monahan & Steadman, 1994; Steadman, Cocozza, & Melick, 1978). However, expanding the criterion of measurement has resulted in substantially higher rates. By including not only arrest rates but also re-hospitalization rates for acts that would have resulted in arrest for a violent crime, it was found that base rates jumped to 25-30% within the same 1-year follow up period (Klassen & O’Connor, 1987, 1988a, 1988b, 1988c, 1990). Likewise, Otto (1992) found that approximately 15-28% of patients in a hospital setting
engaged in physically assaultive behavior, and 40-50% engaged in more broadly defined dangerous behavior.

Similar base rates have been obtained when using patient self-report. Steadman et al. (1994) found that 27% of participants reported at least one violent event within a 6-month follow-up period. Lidz, Mulvey, and Gardner (1993) followed 714 patients who had presented to a psychiatric emergency room for 6 months after release into the community. They found that 45% of these cases reported engaging in violent behavior.

With regards to specific populations, gender appears to play much less of a role in determining base rates among the mentally disordered than among the general population. Although men have higher base rates in general (Federal Bureau of Investigation, 1993), rates of violent behavior are similar and sometimes higher for women when the diagnosis of a mental disorder is considered (Lidz et al., 1993; Steadman et al., 1994).

Among the mentally ill, base rates have generally been examined in community settings (no hospitalization), pre-hospitalization periods (within a community setting), during the course of hospitalization, and post-hospitalization periods (within a community setting)
Swanson, Holzer, Ganzu, and Jono (1990) provided perhaps the best estimate of the incidence of violent behavior among the mentally ill living in the community. Using self-report data from a large-scale National Institute of Mental Health epidemiological study, it was found that rates of violence varied widely depending upon diagnostic category. For example, anxiety disorders had rates of violence no different from the non-mentally ill group (2%), while other groups were significantly higher (e.g. 8% for schizophrenia, 21% for substance abuse). Overall, potential to commit a violent act increased when a person was diagnosed as mentally ill, and increased further with the number of diagnoses (Otto, 1992).

Higher base rates of violent behavior have been found among the previously hospitalized mentally ill during pre-hospitalization periods in the community (Otto, 1992). This makes sense, as a greater incidence of violence might be expected within this population since it may have been the violent behavior that resulted in the hospitalization in some cases. The period of study before hospitalization ranged between 2 weeks (McNiel & Binder, 1986; Tardiff, 1984; Tardiff &
Sweillam, 1980), to 2 days (Rossi et al., 1985), to immediately before hospitalization and subsequent evaluation (Craig, 1982; Skodol & Karasu, 1980). Using a restrictive definition of dangerousness, investigators found base rates of pre-admission violence ranging from 10-12% (Craig, 1982; Tardiff, 1984). The use of more inclusive definitions of dangerousness resulted in base rates ranging from 20-36% during pre-admission periods.

When analyzing base rates of violence during periods of hospitalization, both the length and nature of the hospitalization must be considered (Otto, 1992). In non-acute, long-term hospitals, rates of violence are lower (7-10%) during the 3 months to 1 year after admission (Tardiff & Sweillam, 1982). This stands in comparison to the higher rates (40 to 50%) found in acute care settings during the 3 to 14 days after admission (Rofman, Askinazi, & Fant, 1980).

Lastly, base rates of violence have been examined for post-hospitalization periods. Klassen and O’Connor (1988a, 1988b) examined rates of violence during a 1-year follow up period among 236 males treated at an acute-care, inpatient facility and who were considered potentially violent. Thirty percent were either arrested
for a violent crime or readmitted to the hospital for an act that would have resulted in arrest. They found similar results in other studies (Klassen & O’Connor, 1987, 1990).

In summary, early estimates of base rates of violence among the general population determined the prevalence to be so low as to render prediction vulnerable to excessive false positives. However, the moderate base rates of violence identified among the mentally ill before, during, and after hospitalization suggest that violence prediction within this population may not be similarly doomed. This is especially likely to be true when using more broad definitions of violent behavior.
Second Generation Research

Monahan's (1981) review and critique of "first generation" research on violence prediction served as a turning point from which future studies would be evaluated. Monahan (1988) later summed up four major shortcomings of the early research: a) inadequate predictor variables, b) poorly defined and inadequate criterion measures, c) constricted samples, and d) unsystematic and poorly organized research efforts.

To resolve the problem of inadequate predictor variables, Monahan (1988) encouraged researchers to assess subjects across domains, assess factors theoretically relevant to violence, and assess situational factors. To strengthen criterion variables, Monahan recommended including as criteria rehospitalizations resulting from violence, developing standardized measures of self-reported violence, developing better tracking methods in the community, and assessing subjects over time. To improve samples, Monahan recommended obtaining ratings of relative risk of subjects judged to be appropriate for release early during hospitalization. Lastly, he recommended more collaborative efforts among researchers to improve
organization of future investigations (e.g. definitions of criterion variables).

The majority of "second generation" research has taken most or all of these recommendations into consideration when designing violence prediction studies within current ethical and legal constraints. Otto (1992) aptly determined that:

Of course, the perfect study(ies) designed to assess the ability of mental health professionals to make short-term predictions of dangerous behavior will never be attempted. Ideally, one would have mental health professionals examine a large number of (mentally ill) people and make predictions about the likelihood that they would commit a violent act at some time in the future. Regardless of what their behavior was predicted to be, these people would be allowed to go on their way, although they would be monitored so that their behavior could be recorded. Finally, after some predetermined period of time, the mental health professionals' predictions would be compared to actual outcomes so that their predictive accuracy could be determined. Ethical, legal, and public policy considerations make such a
study impossible; intervention occurs whenever mental health professionals or those in the legal system (i.e. law enforcement officers, judges) have such suspicions. As a result, investigators must examine the issue indirectly. (p. 108)

Despite these concerns, a small number of clinical and experimental prediction studies have been conducted over the last 2 decades.

**Experimental (Actuarial) Prediction Studies**

Relevant base rate studies are unfortunately more abundant than relevant experimental prediction studies (Otto, 1992). The best-known experimental pre/postdiction second generation research was conducted by Klassen and O’Connor (1988a, 1988b). They examined the post-hospitalization adjustment of mentally ill people using 6 to 12 month follow-up periods. Specifically, they followed community adjustment of 236 males who had previously been admitted to an inpatient unit of a mental health center. Patients were classified as violent if they had either been arrested for a violent crime or had a comparable readmission as an inpatient. Klassen and O’Connor developed and applied a prediction equation which resulted in 91% of the subjects being
classified correctly (92% of the nonviolent and 87% of the violent subjects). Reported false positive rates ranged from 7-10%.

While these results seem encouraging, some relevant shortcomings are noted. First, the equation developed by Klassen and O'Connor (1988a, 1988b) involved a total of 64 predictor variables, obtained from a combination of patient interview and extensive chart review. Having such a large number of variables to assess could be considered impractical in most settings, and thus potentially limits the extent to which these findings would generalize. Also, instead of incorporating psychiatric symptoms into the prediction equation, the authors instead devised two separate equations for schizophrenic and non-schizophrenic patients, thus further limiting the utility of such an approach. In order to achieve adequate validity and reliability using this prediction equation, an assumption must be made regarding the accuracy of the schizophrenia diagnosis (Costello, 1992). As predictions of violent behavior can potentially take precedence over differential diagnosis (e.g. upon admission to a facility), using either version of their equation involves a risk of error.
Lastly, in a cross-validation study applying the equation to 265 patients released from the same facility, only 76% were correctly classified overall (83% of the nonviolent and 48% of the violent subjects), and false positives escalated to 15% (Klassen & O'Connor, 1990). The loss in predictive accuracy was greatest for violent patients, which fell to a level just above what would be expected given the base rate for violence. In short, such a finding indicates a lack of validity for their prediction scheme.

Convit, Jaeger, Lin, Meisner, and Volavka (1988) developed a predictive model based on a records review of 109 inpatients. Although 69% were correctly classified, the false positive rate of 40% is considerable. In a second study, they reduced the false positive rate to 32%, but suffered a similar drop in correct classifications (66%).

Webster et al. (1994) combined clinical and actuarial factors in their "Violence Prediction Scheme" for assessing dangerous behavior. It involved extensive records review assessing 12 variables including psychopathy, separation from parents by age 16, victim injury, diagnosis of schizophrenia, marital status,
elementary school maladjustment, female victim offense, failure on prior conditional release, property offense history, age at index offense, alcohol abuse history, and presence of a personality disorder. Although the Violence Prediction Scheme correctly classified about 75% of inmates over 81 months, it lacked in practical utility in that much of the information relating to the above categories is often unavailable or unreliable in forensically committed psychiatric patients.

Clinical Prediction Studies

A number of second generation studies have examined the predictive ability of mental health professionals by comparing their prehospitalization decisions and clinical predictions to actual outcomes (Otto, 1992). However, drawing firm conclusions from clinical outcome research is limited by a number of factors to be discussed after the relevant studies are reviewed.

The accuracy of mental health professionals' classification of 598 people at a metropolitan forensic clinic was examined by Sepejak, Menzies, Webster, and Jensen (1983). Participants were rated on a four-point dangerous behavior scale (no, low, medium, or high) and were followed during a 2-year follow-up period, after
which the following information was gathered: subsequent criminal charges, misconduct during incarceration, incidents resulting in contact with psychiatric facilities, and behavior during psychiatric hospitalization. After the data were collapsed and analyzed, 60% of the subjects were correctly classified and a false positive rate of 42% was obtained.

When the predictive ability of physicians was examined (Janofsky, Spears, & Neubauer, 1988), there was no relationship between predictions and outcomes for assaultive and suicidal behavior. Admitting physicians gave predictions on whether 47 patients at an acute care clinic would engage in threatening, suicidal, or physically assaultive behavior during the seven days following admission. Although the physicians obtained an overall correct classification rating of 85%, this was mostly due to their being correct on predictions of threatening behavior, and they obtained a false positive rate of 30%.

McNiel and Binder (1990) examined the utility of a probabilistic approach. Nurses and physicians estimated the probability that patients from a sample of 152 inpatients would physically assault someone during the
first seven days of hospitalization. Patients were labeled as low, medium, or high aggression (i.e., 0-33% = low, 34-66% = moderate, 67-100% = high) based on the probability that they would either physically assault someone or not and whether they would engage in any aggression. The results were encouraging. The proportion of patients within each predicted “aggression level” who committed some type of physical assault was within the range that would be expected based on the estimate. For example, 68% of patients labeled “high” attacked someone during the first seven days. False positives are more difficult to rate in this case, however, because the “high” probability ranged from 67-100% rather than a prediction of “will” or “will not” physically assault.

Other studies have compared violent behavior of the mentally ill based on the nature of commitment status (voluntary vs. involuntary). Involuntary commitments are often deemed a danger to self or others, implying a prediction of dangerousness. Voluntary commitments (e.g. grave disability or substance abuse) do not carry the same implications. One problem with this assumption is that commitment status does not always reflect the mental
health professional's true impression of the patient's potential for violence. It has been noted that other factors often influence these decisions, such as availability of beds, perception of the patient's need for treatment, the patient's willingness to be treated, and various intricacies of the legal system (Mulvey & Lidz, 1985; Otto, 1992).

One study compared hospital records for both involuntary (59) and voluntary (59) admissions (Rofman, Askinazi, & Fant, 1980). Involuntary commitments were based on a judgment of "dangerous to others" by hospital staff. Voluntary commitments were for reasons other than threat of harm to self or others. A relationship was found between commitment status and violent behavior during the first 45 days of hospitalization. Of the involuntary sample, 41% committed some assaultive act compared to only 8% of the voluntary sample, with the majority of the assaults occurring during the first ten days after admission. This added up to a true positive rate of 83% and a false positive rate of 39%.

Commitment status was also examined by McNiel and Binder (1987) and by Yesavage, Werner, Becker, and Mills (1982). While McNiel and Binder found results similar to
Rofman et al. (1980), Yesavage et al. did not find a difference in assault rates between voluntary and involuntary commitments.

In summary, Otto (1992) noted that the overall false positive rate among second generation studies was somewhat improved (i.e. less than 40%), and that short-term predictions of dangerous behavior were better than chance. These observations were confirmed by Mossman (1994), although it was further noted that the short-term predictions were no more accurate than long-term predictions. Contrary to these views, Menzies and Webster (1995) have stated that the results of second generation studies have been more like those of first generation studies, and that clinical predictions among psychologists and psychiatrists are “almost universally invalid” (p. 775).

Regardless of the view taken, several shortcomings remain apparent. First, there have been relatively few second generation studies of an experimental nature, and among those in existence none have yielded acceptably accurate rates of classification when replicated. Given such low rates of correct classification of violent behavior, it would appear that one would do just as well
to rely upon base rates alone in making such predictions. Second, these experimental prediction studies have typically focused on predictor variables that are either impractical or not readily available for most treatment settings (e.g., having detailed hospital records immediately available in acute inpatient care or emergency settings). Moreover, a number of these predictive factors have been of a static nature (e.g., past drug use, coming from a dysfunctional home). While the importance of such factors in predicting violent behavior are apparent, they fail to take into account changes in the individual due to interventions (e.g., substance abuse treatment) or variations which can occur over time (e.g., variations in psychotic symptoms). This would render the individual falsely classified as always being at risk for violent behavior, leaving one with a prediction which lacks clinical utility and validity (Norko, 2000).

Third, these studies have focused almost exclusively on long-term violence following hospital discharge. As such, there have been no prediction studies of an experimental nature focusing on short-term violence within an inpatient setting. Lastly, these studies have
overall failed to take into account a number of factors theoretically relevant to violent behavior. These will be discussed in the section that follows.
Risk Factors and Predisposing Variables

Over the last decade, a number of studies have identified risk factors and predisposing variables that have been linked, either empirically or theoretically, to potential for violent behavior. The following is a summary of those variables that may provide a greater contribution in developing a violence prediction equation, along with relevant studies for each. These risk factors, suggested to be important in violence prediction in review of the literature, provide the basis for the present study.

Anger

One conspicuous shortcoming of recent research on violence prediction is the neglect of anger as a risk factor (Novaco, 1994). This is surprising, given the commonly acknowledged relationship between the arousal created by anger and aggression (Monahan, 1981; Rule & Nesdale, 1976). More specifically, Novaco and Renwick (1998) have noted that while anger per se is "neither necessary nor sufficient for aggression, (it) is a significant activator of aggression, which is otherwise regulated through inhibitory controls" (p. 200), (i.e., thus implicating problems with control and expression).
Among the difficulties in studying the effects of anger, Novaco (1994) cited that most measures of the levels and expression of anger have been designed for use with a non-clinical population. Nonetheless, at least one study (Kay, Wolkenfeld, & Murrill, 1988) found anger to be the strongest predictor of physical aggression in the clinical and diagnostic profiles of over 200 psychiatric inpatients.

The State-Trait Anger Expression Inventory (STAXI; Spielberger, 1979) is one identified measure of an individual's self-reported expression of anger and perceived control over angry responses. The STAXI is one of the most commonly used anger measures, and was developed in part from items originally used in the Buss-Durkee Hostility Inventory (Buss & Durkee, 1957).

**Psychotic Symptoms**

Several of the aforementioned studies reported on the rates of violent behavior among specific diagnostic groups of mental illness. However, diagnostic categories are often broad in nature, and by design allow for a substantial degree of variation in specific behaviors among individuals given the same diagnosis (e.g., one patient with schizophrenia may have hallucinations
whereas another may not). By focusing on diagnostic categories, important information about the potential contribution of specific symptoms is obscured.

Thus, a number of recent studies have examined the association between specific psychotic symptoms and violent behavior. Using the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), Lowenstein, Binder and McNiel (1990) compared ratings on the BPRS (taken at the time of admission) with the occurrence of physical assaults during the first week of hospitalization. Hallucinatory behavior was found to be significantly higher among those patients who were physically assaultive during the first week. It was also reported that the association between hallucinations and assaults occurred within the context of a general tendency for psychotic symptoms to be associated with violence.

Werner et al. (1984) also found a significant correlation between psychosis (specifically hallucinatory behavior) and assaultive inpatient behavior ($r = .37$). While this correlation was not directly identifiable in a study by Yesavage et al. (1981), hallucinatory behavior in combination with grandiosity was found to predict assaultive behavior. Conversely, Swanson, Borum, Swartz,
and Hiday (1999) failed to find any significant associations between violence and paranoia, "psychoticism", or psychiatric diagnosis.

In a recent overview of the studies investigating the relationship between psychiatric symptoms, diagnoses, and violent behavior, Norko (2000) concluded that it is currently difficult to draw any firm conclusions, given contradictory findings. While it does not appear that status as a mentally ill patient in and of itself carries predictive utility in determining risk, a diagnosis of psychosis has overall been modestly associated with violence (Link & Stueve, 1994). A potential confound with investigations in this area appears to be in the way some of these studies have treated psychotic symptoms as static phenomena, i.e., making long-term predictions on the basis of current symptoms of a potentially transient nature. It may thus prove beneficial to focus on more short-term predictions when using transient factors as predictors.

Intelligence

Theoretically, it would seem likely that individuals with lower intelligence would be more at risk for violent behavior. This would be based upon the assumption that
such individuals would lack the necessary cognitive elements to correctly perceive ambiguous situations, effectively communicate their needs, or formulate more appropriate strategies for dealing with anger provoking situations. However, the empirical relationship between IQ and violent behavior has been somewhat ambiguous (Brizer, 1989). In one study, patients with lower educational levels were reported to have more problems with assaultive behavior prior to hospital admission (Tardiff & Sweillam, 1980). Conversely, Rossi et al. (1986) found no such relationship. A number of studies have identified cognitive deficits as correlates of violence and crime (Klassen & O’Connor, 1994). Similarly, several studies have found low intelligence per se to be significantly correlated with violence (Holland, Beckett, & Levi, 1981; Klassen & O’Connor, 1987; Lewis et al. 1979). However, the findings of both Pfeffer, Plutchik, and Mizruchi (1983) and Black and Spinks (1985) failed to support this relationship.

Attribution and Self-Esteem

Attributional style for interpreting negative outcomes has been proposed to be linked to violence, in that internal attributions are associated with self-blame
while external attributions are associated with blaming others (Tennen, & Herzberger, 1987; Tennen, Herzberger, & Nelson, 1987). Specifically, an externalizing attributional style is likely to result in the individual's attempt to remedy the negative outcome of the event by nullifying the source of the negative outcome (i.e. whoever is blamed for the negative outcome). Violence, then, toward the perceived source should not come as a surprise, especially among individuals who rate high in both anger and outward expressions of anger. This way, the view of the self as blameless is preserved, thus resulting in a decreased vulnerability toward depression. In contrast, among persons with an internal attributional style, undesirable life events are attributed to enduring qualities of the self. Tennen et al. (1987) hold that such a style is actually a precursor of certain depressive episodes, and represents a global depressive attributional style.

Self-esteem plays a central role in most psychological theories of depression. Both self-esteem deficits (Beck, 1967; Becker, 1979; Freud, 1917) and dysfunctional self-esteem maintenance (Alloy, 1982) have been posited as critical to the development and course of
depressive episodes. Yet the literature on attributional patterns in depression has paid little attention to the role of self-esteem (Tennen, Herzberger, & Nelson, 1987). There is evidence that the same attributional style found reliably in depressed individuals is found in people who are not necessarily depressed, but who have low self-esteem (Fitch, 1970).

Similarly, Ickes and Layden (1978) found that high self-esteem subjects attributed positive outcomes to internal causes in a similar way as low self-esteem subjects. For negative outcomes, high self-esteem subjects made external attributions while those with low self-esteem engaged in self-blame attributing failure to internal causes. Overall, depressed individuals and those with low self-esteem make internal attributions for failure as well as success, while nondepressed people and those with high self-esteem differentially attribute success more to internal factors and failure more to external factors.

Taken together, this information suggests that while people who accept personal responsibility for bad events feel badly about themselves, people who engage in external blame feel badly toward whatever or whomever is
perceived as responsible for the negative outcome. Therefore, those persons with both low self-esteem and internal attributional styles would appear to be more at risk for depression, while those with high self-esteem and external attributional styles would be less likely to be depressed and more likely to become angry, resentful, and possibly even violent toward the source of the negative outcome.

**Associations Between Violence and Morality**

Given the above discussion concerning attributional style, one must question the path from "wanting to punch the perceived source of the negative outcome" to actually engaging in punching behavior. It has been suggested that the difference may involve the presence or absence of "moral emotions" (Dinitz, 1978). Monahan (1981) reported that affective reactions inhibiting violence (or predisposing toward peacefulness) include these "moral emotions" of empathy for the source of a frustration and guilt about injuring another. He also mentions possible anxiety reactions about engaging in violence or about the victim's possible retaliation. The lack of capacity for such affect has been viewed as the keystone of the "sociopath" (Dinitz, 1978). Our nation's federal court
system takes into consideration the mental capacity of an offender to determine "right" from "wrong." It is possible that although a violent offender may possess the intellectual or mental ability to recognize an act as right or wrong, he may lack the "moral emotions" that are the basis for his own personal convictions regarding either the virtuosity or inherent "evilness" of an act.

Kohlberg (1976), in a discussion and model of moral development, posited that individuals at the "preconventional level" of moral development do not yet justify moral decisions on the basis of societal conventions. Rather, they explain their moral judgments in terms of their own interests or the interests of those close to them. To one in the preconventional level, rules are seen as being imposed from outside the individual. Someone at this level is likely to base their actions on their own self-interest rather than a distinction between right and wrong. In behavioral terms, the individual at this level would repeat behaviors that he is reinforced for and/or is not punished for, and avoid behaviors that he knows or believes will be punished. The development at this
point, then, is likely to be more hedonistic than morally based.  

An individual lacking in appropriate moral development is likely, then, to lack semantic association between violence and immorality. Simply put, the individual may commit the violent act merely because he does not see it as wrong to do so. Further, if the violent act achieves the desired outcome for the individual, violence may well become the preferred problem solving technique for that individual. Kohlberg also noted that individuals showed internal consistency in their moral reasoning. That is, an individual would tend to reason in similar ways, no matter what issue he was evaluating. Therefore, if violence is not seen as immoral, and achieves the desired outcome, it is likely to be unilaterally viewed by the individual as acceptable behavior. One way of examining morals involves examining the structure of the individual's moral associations.  

Although the literature is lacking in any empirical study exploring the moral associations of violent offenders, it is possible to conduct such an investigation using a methodology called Pathfinder that explores and depicts associative networks based on
ratings of relatedness of concepts (Schvaneveldt, 1990). This computer-based algorithm presents individuals with pairs of words that are rated on similarity or relatedness. Each word is paired with each other word, resulting in a graphic depiction of the individual’s associative network for those terms. If an individual lacks associations between violence and immorality, Pathfinder will depict that as an absence of a link between violent terms and immoral terms. It is possible that violent offenders, having similar associative networks regarding violence, lack consistent associations between violence and immorality.
The Present Study

In summary, violence prediction studies have been plagued by a number of obstacles. Aside from the shortcomings noted by Monahan (1981), it was noted that the "first generation" of violence prediction studies were characterized by error rates which far exceeded their unacceptably low rates for correct classification. While the "second generation" of violence prediction studies took into account most of Monahan's suggestions for improving methodology, a number of shortcomings remained apparent. For example, it was noted that only a few of these studies utilized what he described as an "experimental" (empirical) design, and among those that did, none produced acceptable rates of correct classification upon replication. There was also noted a tendency to focus on prediction factors of an unchanging nature, which it has been argued limits the clinical utility of such an approach (i.e., Norko, 2000). This has occurred in conjunction with a trend to focus on predictors that are either impractical or not readily available in most acute care settings (e.g. access to detailed hospital records, knowledge about family dynamics).
In reviewing these studies, it was apparent that relatively few have focused upon violence prediction within an inpatient setting, instead focusing on behavior that occurred after release from the institution. While this holds particular relevance for commitment decisions, it does little to address concerns about violent behavior and its impact in the treatment setting (e.g., injury to staff and patients, damage to hospital property, disruption of therapeutic milieu) (Novaco & Renwick, 1998). Moreover, it was noted that none of these studies focused on predictions of violence among a patient population for whom this is particularly relevant, i.e., forensic inpatients, who are often hospitalized secondary to committing a violent offense or having been adjudicated a danger to self and/or others.

The present study was designed in an attempt to improve upon previous violence prediction studies in the following ways. Foremost, it investigated the short-term prediction of violent behavior among an often neglected population, i.e., forensic inpatients. Second, in accordance with the suggestions of Monahan (1988) the present study improved upon previous studies by incorporating multiple factors theoretically relevant to
violence as well as pertinent situational factors (e.g., nature of current charge). This included information regarding specific psychotic symptoms and intelligence, and information regarding self-report of anger, self-esteem, attributional style, and associations between violence and morality.

Third, an examination of the contribution of these factors was accomplished through a systematic empirical investigation wherein a sample of inpatients with and without a history of violent behavior during the first 2 weeks of admission were assessed for their current standing on the aforementioned factors. These data, as will be reported later, were analyzed through a linear discriminant analysis to determine the best combination of variables that could accurately classify the two groups in terms of their past behavior (i.e., postdiction phase). In a second phase of the study, the resulting classificatory scheme was applied to the data obtained from a sample of newly admitted patients to determine if they could be accurately predicted to engage in violent behavior during the first 2 weeks of admission. Moreover, multiple and behaviorally oriented tracking methods were employed to monitor the behavior of these
patients in an attempt to improve upon previous methodology. In the methods section, we will discuss specific measures and techniques utilized in tracking violent behavior.

Despite the large number of base rate studies previously mentioned, it was noted that none of the second generation studies mentioned had statistically incorporated this information. Thus, in keeping with the suggestions of Monahan (1981), the present study was designed to improve upon previous investigations by determining the local base rate for violent behavior within the first 2 weeks of admission and incorporating this information into the final analysis (i.e., determinations of validity and effectiveness).
Hypotheses

The primary goal of this study was to determine if forensic inpatients who engage in violent behavior early in the course of admission (first 2 weeks) could be differentiated from those who do not on the basis of multiple variables which may either moderate or contribute to violent behavior. Given that several potential predictors of both static and transitory natures have been identified through either experimental or theoretical methods, we were interested in the best combination of variables that could predict violent behavior. As such, it was hypothesized that through the use of multiple self-report (transitory) and historical (static) variables, a valid and effective prediction scheme would be obtained which maximized accurate identification of true cases while minimizing error (false positives and false negatives). It was further hypothesized that this classification scheme would better classify than base rates alone.

While some of the variables in question have been investigated, a number have not been examined in this context. Moreover, because the primary goal of discriminant analysis is to determine the best
combination of variables, information regarding the separate contributions of individual variables is overlooked in the statistical output. Therefore, in order to more closely examine their importance, several additional hypotheses were offered regarding individual predictor variables.

First, regarding the Expanded Brief Psychiatric Rating Scale (BPRS), ratings on the hallucinatory behavior, conceptual disorganization, unusual thought content, and suspiciousness, scales of the BPRS were predicted to discriminate between violent and nonviolent groups with higher ratings corresponding with violent behavior. This hypothesis was based on several studies of assaultive behavior in an inpatient population. On three different occasions, Yesavage et al. (1981, 1982, and 1983) found a relationship between some or all of the above scales of the BPRS and assaultive behavior.

Although the relationship between IQ and violent behavior has remained somewhat inconsistent (Brizer, 1989; Klassen & O'Connor, 1994), it clearly merits further confirmatory investigation. In the present study, it was predicted that IQ would be negatively associated with short-term violence. This prediction was
made due to the greater volume of research finding this relationship (as opposed to no relationship; Lewis et al., 1979; Holland, Beckett, & Levi, 1981; Tardiff & Sweillam, 1980; Puinsey & MacGuire, 1986; Klassen & O’Connor, 1987).

Regarding the Attributional Style Questionnaire (ASQ), participants exhibiting external attributional styles were predicted to be more likely to be violent than participants with internal attributional styles. This prediction was made for a number of reasons. First, as was discussed earlier, people with globally internal attributional styles are more likely to be depressed and have low self-esteem. Since low self-esteem is predicted here to identify nonviolent participants, it stands to reason that a globally internal attributional style would do the same. Additionally, since people with globally external attributional styles are more likely to blame others for negative outcomes, it could be predicted that they are also more likely to be violent than those participants with globally internal attributional styles.

Given previous speculations about the mediating influence of anger on violent behavior (i.e., Novaco & Renwick, 1998), it was hypothesized that patients with a
history of violent behavior would report a greater tendency to express their anger through aggressive behavior. Specifically, using self-report data from the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1979), it was predicted that violent patients would score higher on the anger-expression (ANGEX) scale. Additionally, it was predicted that these same individuals would report less ability to control their angry expressions, thus obtaining lower scores on the anger-control (ANGCON) scale of this measure.

Regarding Pathfinder networks, it was predicted that within the group of violent patients, there would be more links between violent terms (VT) and moral terms (MT) than between violent terms (VT) and immoral terms (IT). Nonviolent patients were predicted to have more links between violent terms and immoral terms than moral terms. Similarly, between groups, violent patients were predicted to have more links between violent terms and moral terms than nonviolent patients and fewer links between violent terms and immoral terms than nonviolent patients. That prediction was based on suggestions that violent individuals lack the "moral emotions" necessary
to deter violent behavior on grounds of immorality
Methods

Participants

It is useful to conceptualize this study in two parts; the first developing the prediction equation, and the second cross-validating the equation on a new sample. In part one of the study, the charts of inpatients at the Eastern Louisiana Mental Health System’s (ELMHS) Forensic Division were reviewed to determine if the individual had engaged in a violent act during the first 2 weeks after admission to the facility. In accordance with the suggestions of Monahan (1981), an act was defined as violent if it involved either the actual use (physical act) or overt threat (verbal act) of force likely to result in injury. Potential participants were then independently interviewed by a staff psychologist for (a) ability to provide informed consent (b) presence of severe psychopathology (e.g., severe conceptual disorganization) that could interfere with ability to complete the study and (c) significant suspicion of malingering.

Appropriate candidates were then approached for participation. It was made clear to potential participants that their participation was voluntary and
confidential (procedures to ensure protection of confidentiality will be discussed in the procedure section), they would be paid 4 dollars for their participation, and they would not be penalized for non-participation. This yielded a sample of 80 male forensic inpatient participants, classified into equal size groups (N=40) of violent (V) and nonviolent (NV), based upon the presence or absence of violent behavior during the first 2 weeks of admission.

In the second part of the study, newly admitted inpatients were similarly screened for the presence of interfering factors and ability to provide informed consent. Among those identified as appropriate candidates, a total of 20 inpatients were solicited for participation in the prediction group (PG). Individuals in all three groups were paid 4 dollars for their participation. There was an overall refusal rate of 10.7% (12 refusals out of 112 solicited).

Materials

Rosenberg Self-Esteem Scale. The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) was used to obtain participant's self-reported level of self-esteem. It is composed of 10 items reflecting attitudes of self-
acceptance, and are rated by the respondent on a 4-point scale ranging from 1 "strongly disagree" to 4 "strongly agree." Half of the items are worded to reflect low self-esteem (e.g., "I feel that I do not have much to be proud of."), and are reverse-scored. The scores for all items are then summed to obtain a total score, which can range from 10 to 40 and with higher scores reflecting higher levels of self-esteem.

The RSES has demonstrated good convergent validity with other self-esteem measures (Silber & Tippett, 1965) and strong predictive validity (Rosenberg, 1965). Also, the RSES was employed by both Brewin and Furnham (1986) and Tennen et al. (1987) in their studies of self-esteem and attributional style. For the present study, a high level of internal consistency was obtained with a Cronbach's alpha of .82 for the entire sample.

Attributional Style Questionnaire. The Attributional Style Questionnaire (ASQ; Peterson et al., 1982) consists of 12 hypothetical scenarios (6 with positive outcomes and 6 with negative outcomes) which respondents are asked to vividly imagine having happened to them. They are then instructed to provide the one most likely cause for each event, which is then rated on
three separate 7-point scales pertaining to the perceived locus (internality), stability, and globality of the cause. Since the present study was only concerned with the possible relationship between participants' degree of externalizing (i.e., blaming others for negative outcomes while taking credit for positive outcomes) and violent behavior, only the internality scale was rated by participants. Thus, participants rated each causal event on a scale ranging from 1 "totally due to others" to 7 "totally due to me."

Ratings were summed for the six positive and six negative events separately. Total ratings for negative events were then subtracted from the total ratings for positive events to obtain an "externalizing bias" (ASQbias) score. Thus, positive scores indicate the presence of an externalizing attributional style, with higher scores reflecting a greater degree of externalization. Conversely, negative scores would indicate an internalizing attributional style.

The ASQ is useful in that it allows for direct comparisons with other recent studies of attributional style (e.g., Tennen et al., 1987). Moreover, evidence in support of the ASQ's predictive validity has been
presented by Metalsky, Abramson, Seligman, Semmel, and Peterson (1982). For the present study internal consistency was rather modest, with an alpha of .66 for positive internal scale items and .58 for negative internal scale items. These levels are consistent with those provided in an overview of studies on the ASQ (Reivich, 1995).

State-Trait Anger Expression Inventory. The State-Trait Anger Expression Inventory (STAXI; Speilberger, 1979) was used as a measure of participants' self-reported expression of anger and perceived control over angry responses. The STAXI is one of the most commonly used anger measures, and was developed in part from items originally used in the Buss-Durkee Hostility Inventory (Buss & Durkee, 1957) as well as other anger measures. It consists of 44 items rated on 4-point scales, with items broken down to form six scales and two subscales including state anger, trait anger (angry temperament and angry reaction), anger suppression, anger expressed outward, anger control, and anger expression.

Since the current study was more concerned with those aspects of anger theorized to modulate aggression (anger control and anger expression), only these two
scales were computed and used for analysis. The anger control scale (ANGCON) is composed of 8 items reflecting perceived ability to control anger (e.g., "I can stop myself from losing my temper."). These are summed to produce a total score, with higher values reflecting greater ability to control anger. In accordance with the scoring system outlined in the measure's instruction manual (Speilberger, 1979), the anger expression scale is computed by adding together the total scores for the anger suppression and anger expressed outward scales, subtracting the total score for the anger control scale, and adding a corrective factor. Thus, higher scores on this scale indicate a greater tendency to express angry feelings.

Acceptable validity and reliability have been reported for this measure as a whole by Jacobs, Latham, and Brown (1988) and Stoner (1988). Spielberger et al. (1983) found high internal reliability for trait-anger (.88-.92) while test-retest reliability was somewhat lower (.54). The trait scale has been found to have significant concurrent validity with other self-report anger and hostility measures (Novaco, 1994), but its predictive value has yet to be examined. Using a sample.
of prison inmates, Spielberger (1979) reported good levels of internal consistency across all scales (.73 to .91). High internal consistency was found for the two scales used in this study, with an alpha of .88 for ANGCON and .80 for ANGEX.

**Shipley Institute of Living Scale.** In order to obtain an estimate of participants' level of intellectual functioning, the Shipley Institute of Living Scale (SILS; Zachary, 1991) was administered. The SILS is composed of a 40 item vocabulary test and a 20 item test of abstract thinking. Although tables are provided in the manual for easy computation of WAIS-R Full Scale IQ scores, a continuous norming procedure taking into account the individuals age is provided for computing IQ scores. Since this method is considered more accurate, it was used in the present study.

The SILS has been widely used for quick and accurate assessment of intellectual functioning. Although Zachary (1991) noted that issues have been raised concerning the influence of such variables as age, education, level of cognitive functioning, and socioeconomic status, the SILS appears to be both a reliable and valid method for obtaining general IQ estimates in both group and
individual settings. Moreover, the SILS was restandardized in 1970 with a mixed sample of psychiatric patients (Zachary, 1991), making it an appropriate choice for the present study.

Expanded Brief Psychiatric Rating Scale. The Expanded Brief Psychiatric Rating Scale (BPRS; Ventura et al., 1993) was used to obtain ratings of current symptomatology for all patients. It is commonly used in research to assess 24 identified dimensions of psychiatric symptoms, with each dimension rated on behaviorally anchored 7-point scales. Ratings can range from 1 (not present) to 7 (extremely severe) and take into account symptom frequency and severity (i.e., interference with functioning). Ventura, Green, Shaner, and Liberman (1994) have reported achieving high levels of interrater reliability and good internal consistency for the component scales of this measure.

Since the current study was concerned with the relation between specific psychotic symptoms and violence, only the Hallucinatory Behavior (HALL), Suspiciousness (SUSP), Unusual Thought Content (UTC), and Conceptual Disorganization (CD) items were rated. Ratings were made on the basis of behavioral observations.
and patient self-report to standard questions posed in an interview format by research assistants trained to a minimum intraclass correlation coefficient of .80 with an experienced and trained Eastern Louisiana Mental Health Service (ELMHS) clinician. Also, for the purposes of this study symptoms were rated for their occurrence during the 2-week interval prior to and including the day of assessment.

Pathfinder. The Pathfinder algorithm was designed by Schvaneveldt (1990) to explore and define a cognitive network given estimates of the proximities for pairs of terms. The terms correspond to nodes on a generated network, and the links in the network are determined by the patterns of proximities (ratings of relatedness). Terms are paired randomly such that each term is paired at some point with each other term. Participants rate the relatedness of the terms on an ordinal scale (generally 1 to 9). Pathfinder generates a graphic network depicting those ratings, as well as presenting data on the number of links between clusters of concepts (e.g., violent and moral terms).

Pathfinder uses two parameters. The q-parameter constrains the number of indirect proximities examined in
generating the network, and is represented by a number between 2 and n-1. The r-parameter defines the metric used for computing the distance of paths and is represented by a number between 1 and infinity. The program assumes only ordinal data and generates the fewest number of links when r is set to infinity and q is set to n-1. These were the settings used in this study.

Pathfinder also generates information on the number of links on each term. From this can be generated the number of links within each cluster of terms, between clusters of terms, and provides a network similarity rating for each individual as compared to each other individual. These data can then be compared for groups of individuals. For the purposes of this study, nine terms were rated (3 violent, 3 immoral, and 3 moral). The terms (Appendix A) were chosen by the experimenter. Term choices were then validated by having 20 psychology graduate students assign each of the nine terms to one of the three categories (violent, immoral, and moral). Participants had an agreement rate of 98.8% for violent words, 97.9% for immoral words, and 98.6% for moral words. The data relevant for this study were the resulting number of links occurring within each category.
It was noticed during the collection of the Pathfinder data that patients varied in their response styles on this task in one of three primary ways. They either used ratings at the endpoints of the scale (1 or 9; 2-point response style), endpoint ratings and including the midpoint (1, 5, or 9; 3-point response style), or they used points along the entire scale (full-scale response style). Because this range of response styles was noticeably different than the experimenter's previous experiences using Pathfinder, and since these differing response styles may have represented variations in how patients attended to the task, it was decided to empirically analyze patients' response styles (RESPSTYL) as a variable in the subsequent analyses. Another method of examining how patients were attending to the task was to examine the cohesiveness scores of individual participants. Scores approaching 1.0 would suggest that the participant was attending to the task appropriately,
while scores closer to 0.00 suggest less attending. However, it should be noted that level of training or education often effects cohesiveness scores in that lower education is often associated with lower cohesiveness scores.

Demographics Form. Relevant demographic data was obtained for each participant through a review of their ELMHS medical records and recorded on a demographics form (Appendix B). Information included the participant’s age at the time of the study, ethnicity, total years of completed education, current charge(s) (including whether the crime was either predatory or instrumental in nature if violent), psychiatric diagnosis, medication status at the time of admission, history of arrest for violent crime (prior to the current charge), whether or not the patient had engaged in a violent act during the first 2 weeks of admission, and the nature of the violent act. Based upon the definition of Megargee (1976), current charge(s) and previous offenses were classified as violent if they involved “engaging in or threatening behavior that is (1) directly injurious or destructive, or potentially injurious, to persons or property and (2) currently prohibited by state/federal laws and statutes”
Some examples of violent charges would include murder, simple assault, and rape.

**Procedures**

As mentioned, all potential participants were carefully screened for their ability to participate. After obtaining informed consent (Appendix C), all participants in both the postdictive phase (40 violent and 40 non-violent) and predictive phase (20 new admits) were administered the SILS, RSES, ASQ, STAXI, Pathfinder task, and rated on the specified items of the BPRS. To eliminate any potential confounds of reading comprehension deficits, all of the self-report measures (with the exception of the SILS) were read out loud to all participants, and their responses recorded by an examiner.

The behavior of the 20 newly admitted patients serving in the prediction group was monitored for a 2-week time period for the occurrence of violent acts. This was accomplished through several methods. First, patients were interviewed on a weekly basis regarding their interactions with others and whether any violent behavior took place. Second, their ward charts were reviewed daily for staff notes indicating violent
behavior. Third, staff members were asked to fill out a daily checklist on participants' behavior, specifically as it pertained to the occurrence of violent behavior. As a safeguard, ward staff were interviewed at the end of each week about the behavior of each patient. As discussed earlier, the operational definition of violent behavior presented by Megargee (1976) was used for this task.

Once data was collected, it was scored according to the methods outlined for each measure. Since a linear discriminant analysis was to be used to analyze the data, categorical (non-interval) variables had to be coded into a dichotomous format for proper analysis. This was applied to two of the variables from the demographics form and the response style variable from the Pathfinder task. Thus, "nature of current charge" (CHARGE) and "history of violent crime" (HVC) were coded as 0 'violent' and 1 'nonviolent', and the response style variable (RESPSTYL) as 0 '2- or 3-point responding' and 1 'full-scale responding'.

Lastly, it should be noted that patient confidentiality was protected in the following manner. Participants were identified on a master list linking
their names to an identification number. Only their identification number appeared on self-report measures, interview materials, and tracking records obtained during the course of the study (excluding the consent form). Access to the master list was limited to only the primary investigator and assistants. After all the data had been collected, the master list containing identifying names was destroyed, thus preventing any further linkage of patients to their data.
Results

Local Base Rate Data

Approximately 2 months prior to the collection of data, an historical chart review of all patients housed on the ELMHS Admissions unit was conducted to obtain local data on the base rate of violent behavior. Of the 73 patients housed on the unit, 13 (17.8%) had engaged in some form of verbal violence (threatening actual physical harm) during the first 2 weeks after admission. Another 13 (17.8%) had engaged in some form of physical violence during that same time period, which included attacking another patient (N=3), attacking ELMHS staff (N=4), destruction of hospital property (N=4), and injury to self (N=2). Combined, these figures yielded a base rate of 35.6% for violent behavior during the first 2 weeks of admission, which is comparable to that reported in earlier studies (e.g., Rofman et al., 1980). It was further noted that 49 of the 73 patients (67.1%) had a commitment offense involving violent behavior (primarily murder and aggravated battery), and another 8 (10.9%) had been admitted on an emergency basis for violent behavior.
Demographic Data

The demographic variables of ethnicity, medication status during the first 2 weeks of admission, and type of violence if there was a current charge involving violent behavior (i.e., predatory vs. instrumental) were examined for group differences using chi-square analyses. There were found no significant differences between the V and NV groups in terms of racial composition ($p=.488$), medication status during the first 2 weeks of admission ($p=.16$), or predatory violence ($p=.07$). Also, separate oneway analyses of variance (ANOVA) revealed no significant differences between the V and NV groups in terms of age ($F[1,79]=.008; p=.928$) or years of education ($F[1,79]=.241; p=.625$) (Table 2).

Since no significant differences were found between groups on these demographic variables, and as there were no a priori predictions made concerning these factors, they were excluded from subsequent discriminant analysis. Moreover, the fact that 12 patients in the NV group and 4 patients in the V group did not have a current charge involving violence resulted in 16 patients who could not be coded on the "predatory violence" variable. Given that the discriminant method would have excluded these 16
cases from all analyses, and as there were no significant group differences on this dimension, "predatory violence" was excluded as a potential predictor variable.

Table 2

Demographic Variables by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Violent (N=40)</th>
<th>Non-violent (N=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afr.-Amer.</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>Caucasian</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Type of Violence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predatory</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Instrumental</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>No Violence</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Medication Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antipsychotic</td>
<td>31</td>
<td>23</td>
</tr>
<tr>
<td>Mood Stabilizer</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Age</td>
<td>37.8(10.2)</td>
<td>38.0(9.6)</td>
</tr>
<tr>
<td>Education</td>
<td>9.9(2.5)</td>
<td>10.2(2.96)</td>
</tr>
</tbody>
</table>

Note. Ethnicity, Medication Status, and Type of Violence represented in number of actual cases. Age and Education expressed in years, as M(SD).

Discriminant Analysis

In order to test the hypotheses in question, a linear discriminant analysis was conducted to determine the best combination of predictor variables in differentiating the violent (V) and nonviolent (NV)
groups. In this analysis, group membership (V and NV) served as the dependent variable, and the independent (predictor) variables included the following: "anger expression" (ANGEX) and "anger control" (ANGCON) scales from the STAXI; the 6 subscales produced by Pathfinder analysis (WCV, WCM, WCI, BCVM, BCVI, BCMI); estimated intelligence from the SILS (IQ); total self-esteem score from the RSES; the self-serving bias score computed from the ASQ (ASQBIAS); the 4 psychotic symptom items from the BPRS (suspiciousness [SUSP], hallucinatory behavior [HALL], unusual thought content [UTC], conceptual disorganization [CD]); history of arrest for violent crime (HVC); nature of current charge (CHARGE; violent vs. nonviolent); response style (RESPSTYL) used on the Pathfinder task (2- and 3-point responding vs. full scale responding).

In the first step of the discriminant analysis, differences between V and NV on each of the individual predictor variables were analyzed using univariate F-tests. The means, standard deviations, Wilks' lambda (proportion of total variance in discriminant scores not attributable to differences between groups), and level of significance are listed in Table 3.
Table 3

Means of Individual Predictor Variables by Group

<table>
<thead>
<tr>
<th>Predictor</th>
<th>V (N=40)</th>
<th>NV (N=40)</th>
<th>Wilks'</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANGEX</td>
<td>29.20 (11.53)</td>
<td>24.15 (10.91)</td>
<td>.95068</td>
<td>.05</td>
</tr>
<tr>
<td>ANGCON</td>
<td>21.28 (6.16)</td>
<td>24.18 (5.84)</td>
<td>.94348</td>
<td>.03</td>
</tr>
<tr>
<td>WCV</td>
<td>1.63 (0.90)</td>
<td>1.85 (0.95)</td>
<td>.98500</td>
<td>.28</td>
</tr>
<tr>
<td>WCM</td>
<td>2.00 (0.91)</td>
<td>2.43 (0.90)</td>
<td>.94639</td>
<td>.04</td>
</tr>
<tr>
<td>WCI</td>
<td>1.75 (1.01)</td>
<td>1.95 (0.99)</td>
<td>.98977</td>
<td>.37</td>
</tr>
<tr>
<td>BCVM</td>
<td>2.50 (2.73)</td>
<td>3.68 (3.53)</td>
<td>.96559</td>
<td>.10</td>
</tr>
<tr>
<td>BCVI</td>
<td>4.43 (2.35)</td>
<td>4.83 (2.78)</td>
<td>.99386</td>
<td>.49</td>
</tr>
<tr>
<td>BCMI</td>
<td>3.25 (2.50)</td>
<td>4.15 (3.33)</td>
<td>.97655</td>
<td>.18</td>
</tr>
<tr>
<td>IQ</td>
<td>73.00 (12.90)</td>
<td>77.28 (10.95)</td>
<td>.96830</td>
<td>.11</td>
</tr>
<tr>
<td>RSES</td>
<td>29.53 (4.87)</td>
<td>30.43 (5.09)</td>
<td>.99170</td>
<td>.42</td>
</tr>
<tr>
<td>ASQBIAS</td>
<td>4.78 (8.81)</td>
<td>6.10 (10.74)</td>
<td>.99536</td>
<td>.55</td>
</tr>
<tr>
<td>SUSP</td>
<td>3.00 (1.83)</td>
<td>2.58 (1.69)</td>
<td>.98528</td>
<td>.28</td>
</tr>
<tr>
<td>HALL</td>
<td>2.05 (1.62)</td>
<td>1.23 (0.80)</td>
<td>.90311</td>
<td>.01</td>
</tr>
<tr>
<td>UTC</td>
<td>2.88 (1.71)</td>
<td>2.43 (1.45)</td>
<td>.97977</td>
<td>.21</td>
</tr>
<tr>
<td>CD</td>
<td>2.20 (1.25)</td>
<td>1.85 (1.03)</td>
<td>.97643</td>
<td>.17</td>
</tr>
<tr>
<td>HVC</td>
<td>0.25 (0.44)</td>
<td>0.40 (0.50)</td>
<td>.97436</td>
<td>.16</td>
</tr>
<tr>
<td>CHARGE</td>
<td>0.10 (0.30)</td>
<td>0.30 (0.46)</td>
<td>.93750</td>
<td>.03</td>
</tr>
<tr>
<td>RESPSTYL</td>
<td>0.58 (0.50)</td>
<td>0.40 (0.50)</td>
<td>.96936</td>
<td>.12</td>
</tr>
</tbody>
</table>

Note: For HVC, the mean reflects the proportion of cases not having a history of violent crime; for CHARGE the proportion of cases not having a violent commitment charge; for RESPSTYL, proportion of cases using a full-scale response style.

This initial examination of the data revealed significantly higher scores for the V group on ANGEX and...
significantly higher scores for the NV group on ANGCON. This supported the hypothesis that individuals who engaged in violent behavior during the first 2 weeks of admission, as compared to those who did not, would report a greater tendency to express their anger while also reporting less ability to control these expressions.

The only BPRS psychotic symptom variable that was found to be significantly different between violent and nonviolent patients was hallucinatory behavior (HALL). Specifically, those patients who had previously been violent were currently reporting significantly greater problems with perceptual abnormalities. This provides limited support for the hypothesis regarding the association between psychotic symptoms and short-term violence, in that the groups did not significantly differ in terms of unusual thought content, suspiciousness, and conceptual disorganization. Thus, it does not appear that such patients overall experience psychotic symptoms of a more severe and chronic nature.

Of the historical variables examined, only the nature of the current charge significantly differed between groups. It was found that approximately 90% of those who engaged in a violent act during the first 2
weeks of admission had originally been committed on a charge of a violent nature, as compared to 70% of the nonviolent group ($p = .03$). Although this would indicate a significantly greater propensity for engaging in a violent act, it should be noted that the proportion of nonviolent patients who had been committed on a violent charge was rather high. Moreover, there was no significant difference between violent and nonviolent in terms of having a history of arrest for a violent crime (75% of the violent vs. 60% of the nonviolent, $p = .16$). This is not entirely an unexpected finding, given that higher security forensic hospitals typically provide services to those considered a danger to self and/or others. However, this does provide evidence that reliance upon past behavior as a predictor for future behavior alone, at least in the short-term, is insufficient for this particular population.

With regard to the Pathfinder data, the only factor that significantly differed between groups was the number of links within the moral category ($p = .04$). In essence, those patients who had not engaged in violent behavior within the first 2 weeks of admission were significantly more likely (at present) to make more associations among
words of moral content. This does not appear to provide support for the hypothesized differences between violent and nonviolent patients in terms of between category links for words of violent-moral and violent-immoral content.

Contrary to hypotheses, there was no significant difference between violent and nonviolent patients in terms of level of intellectual functioning (p=.11). Interestingly, it was noted that the average IQ for all patients fell within the Borderline range. Given the high proportion of (historically) violent behavior among both groups, this does provide some limited evidence for the hypothesized relationship between low IQ and violent behavior. Regardless, this finding potentially limits the utility of IQ as a short-term predictor of violence among forensic patient populations.

The remaining hypotheses regarding the association of violent behavior with increased self-esteem and an externalizing attributional style were not supported. Specifically, violent and nonviolent patients were found to be relatively homogenous in terms of their RSES scores and ASQ bias scores (both p’s>.42).
The second step of analysis involved determining which combination of predictor variables best distinguished (in a postdictive fashion) among those patients who did and did not commit a violent act within the first 2 weeks of admission. To accomplish this, all predictor variables were entered into a linear discriminant analysis (LDA) with group (V and NV) as the dependent measure, and using a stepwise entry method with minimization of Wilks' lambda as the entry criterion. Wilks' lambda (ratio of within-groups sum of squares to total sum of squares) was chosen as the entry criterion because it provides an estimate of the total variability for each predictor variable that is attributable to actual differences between the two groups.

The resulting canonical discriminant function contained only two predictor variables that met statistical criteria for entry (greatest minimization of Wilks' lambda), those being hallucinatory behavior and nature of commitment charge (Table 4).

The canonical correlation (correlation between the resulting discriminant scores and group) was .394, and the resulting Wilks' lambda (proportion of total variance in discriminant scores not attributable to differences
between groups) was .845 (df=2; p=.002). Although the resulting analysis was statistically significant, it was noted that only 15.5% (1.000-lambda) of the variance between V and NV was accounted for by this function.

Table 4

Results of the Discriminant Analysis Using Stepwise Entry

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized Coefficient</th>
<th>Unstandardized Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>HALL</td>
<td>.79920</td>
<td>.6266383</td>
</tr>
<tr>
<td>CHARGE</td>
<td>-.64561</td>
<td>-1.6459882</td>
</tr>
<tr>
<td>(constant)</td>
<td>-.6969226</td>
<td>-.6969226</td>
</tr>
</tbody>
</table>

With regard to classification results (Table 5), a total of 49 cases (61.25%) among both groups were correctly classified. However, this was primarily due to the high proportion of individuals in the NV group being classified correctly (90%). Surprisingly, individuals in the V group were classified incorrectly to a much higher degree than they were correctly classified (67.5% and 32.5%, respectively).
Table 5

Classification Results for the Stepwise Discriminant Analysis

<table>
<thead>
<tr>
<th>Predicted Group</th>
<th>Violent</th>
<th>Nonviolent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent (N=40)</td>
<td>13 (32.5%)</td>
<td>27 (67.5%)</td>
</tr>
<tr>
<td>Nonviolent (N=40)</td>
<td>4 (10.0%)</td>
<td>36 (90.0%)</td>
</tr>
</tbody>
</table>

Although the low false positive rate (10.0%) was very desirable, this came with an unacceptably high rate of false negatives (67.5%). Since the goal was to accurately identify those patients with the greatest potential to engage in short-term violent behavior, that the majority of these individuals were misclassified renders this prediction scheme clinically non-significant. Moreover, the determined base rate of violent behavior during the first 2 weeks of admission was greater than the true positive rate (35.6% > 32.5%). Based upon these findings, it would appear that one would be just as accurate at making predictions about violent behavior by relying strictly on the known local base rate (e.g. if the known base rate is 35%, one could randomly
predict one of every three patients to be violent and achieve a similar hit rate).

Since the linear discriminant analysis (LDA) using a stepwise method could only account for a small percentage of the variance between the two groups and the resulting classification was clinically non-significant, it was decided to use an LDA employing a forced-entry method for all predictor variables. Rather than considering the contribution of variables in isolation, this procedure has the advantage of considering all variables satisfying minimum tolerance criteria simultaneously. "Tolerance" is calculated as $1-R_i^2$, where $R_i^2$ is the squared multiple correlation coefficient for a predictor variable resulting from the computation of a regression equation between that predictor and all remaining predictor variables. In essence, this provides a measure of the degree of linear association between the independent variables, with small tolerance values (i.e., those less than .001) for a predictor indicating that it is almost a linear combination of the other predictors (Norusis, 1988). This procedure avoids use of predictor variables that are linear combinations of other predictor variables, thus permitting one to obtain a unique
solution and avoiding redundant information through the discriminant analysis. The results of the forced-entry method are listed in Table 6.

Table 6

Discriminant Function Coefficients for the Forced-Entry Discriminant Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized Coefficients</th>
<th>Unstandardized Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANGEX</td>
<td>-0.31162</td>
<td>-0.0277566</td>
</tr>
<tr>
<td>ANGCON</td>
<td>0.13756</td>
<td>0.0229282</td>
</tr>
<tr>
<td>WCV</td>
<td>-0.10401</td>
<td>-0.1126611</td>
</tr>
<tr>
<td>WCM</td>
<td>0.20043</td>
<td>0.2216637</td>
</tr>
<tr>
<td>WCI</td>
<td>-0.22045</td>
<td>-0.2213019</td>
</tr>
<tr>
<td>BCVM</td>
<td>0.36266</td>
<td>0.1150705</td>
</tr>
<tr>
<td>BCVI</td>
<td>-0.10245</td>
<td>-0.0397744</td>
</tr>
<tr>
<td>BCMI</td>
<td>-0.05539</td>
<td>-0.0188334</td>
</tr>
<tr>
<td>IQ</td>
<td>0.49564</td>
<td>0.0414292</td>
</tr>
<tr>
<td>RSES</td>
<td>-0.22553</td>
<td>-0.0452709</td>
</tr>
<tr>
<td>ASQBIAS</td>
<td>0.05770</td>
<td>0.0058734</td>
</tr>
<tr>
<td>SUSP</td>
<td>-0.17192</td>
<td>-0.0976510</td>
</tr>
<tr>
<td>HALL</td>
<td>-0.46532</td>
<td>-0.3648479</td>
</tr>
<tr>
<td>UTC</td>
<td>0.09099</td>
<td>0.0573788</td>
</tr>
<tr>
<td>CD</td>
<td>-0.00896</td>
<td>-0.0078534</td>
</tr>
<tr>
<td>HVC</td>
<td>0.33635</td>
<td>0.7183593</td>
</tr>
<tr>
<td>CHARGE</td>
<td>0.53604</td>
<td>1.3666415</td>
</tr>
<tr>
<td>RESPSTYL</td>
<td>-0.27921</td>
<td>-0.5602101</td>
</tr>
<tr>
<td>(constant)</td>
<td>-1.055519</td>
<td></td>
</tr>
</tbody>
</table>

By using all predictors (all of which met the minimum tolerance criteria), a canonical correlation of .543 was obtained, with a Wilks' lambda of .705. While the overall function was not significant by statistical standards (df=18; p=.15), this appeared to be due to the
effect of having a large number of predictors in the equation. Rather, it was noted that by using all of the predictors 29.5% of the total variance between V and NV could be accounted for, which is substantially greater than the 15.5% when using the stepwise method.

A more encouraging classification rate was obtained when using all available predictor variables, as 57 subjects (71.25%) were correctly classified overall. Despite a drop in the classification accuracy for the NV group, there was an increase in accurate classification for the V group. There was a 72.5% hit rate for the V group, with a comparable 70.0% hit rate for the NV group (Table 7). Moreover, the true positive rate was more than double the local base rate for violent behavior, making this method more significant in a clinical sense.

Table 7

Classification Table for the Discriminant Analysis Using Forced Entry

<table>
<thead>
<tr>
<th>Predicted</th>
<th>Actual</th>
<th>Violent</th>
<th>Nonviolent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent (N=40)</td>
<td>29 (72.5%)</td>
<td>11 (27.5%)</td>
<td></td>
</tr>
<tr>
<td>Nonviolent (N=40)</td>
<td>12 (30.0%)</td>
<td>28 (70.0%)</td>
<td></td>
</tr>
</tbody>
</table>
One possible explanation for the discrepant findings between the two analyses is that in the first analysis there was a violation of the assumption regarding equality of covariance matrices. More precisely, LDA assumes that the population covariance matrices of the scores between the two predicted groups are all equal. The test of the equality of group covariance matrices is accomplished through a statistical procedure known as Box's M. It was found that, for the group covariance matrices resulting from the stepwise LDA, Box's M was significant (24.83; \( p < .0000 \)). This would indicate that the group covariance matrices resulting from this analysis were unequal. Conversely, it was found that the group covariance matrices resulting from the forced-entry method were equal (Box's M = 221.01; \( p = .578 \)). Thus, no statistical assumptions were violated when using the forced-entry method, which in turn would make it the more appropriate choice for analyses of these data.

In order to determine the relative order of importance of the individual predictors in discriminating between V and NV, one needs to examine the resulting structure matrix (Pedhazur, 1982). The structure matrix is simply the pooled within-groups correlations between
the predictor variables and the canonical discriminant function, controlling for the shared effects with other predictor variables (Table 8).

Table 8

Matrix of Structure Loadings for the Predictor Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HALL</td>
<td>-.507</td>
</tr>
<tr>
<td>CHARGE</td>
<td>.400</td>
</tr>
<tr>
<td>ANGCON</td>
<td>.379</td>
</tr>
<tr>
<td>WCM</td>
<td>.368</td>
</tr>
<tr>
<td>ANGEX</td>
<td>-.352</td>
</tr>
<tr>
<td>BCVM</td>
<td>.292</td>
</tr>
<tr>
<td>IQ</td>
<td>.280</td>
</tr>
<tr>
<td>RESPSTYL</td>
<td>-.275</td>
</tr>
<tr>
<td>HVC</td>
<td>.251</td>
</tr>
<tr>
<td>CD</td>
<td>-.240</td>
</tr>
<tr>
<td>BCMI</td>
<td>.240</td>
</tr>
<tr>
<td>UTC</td>
<td>-.222</td>
</tr>
<tr>
<td>WCV</td>
<td>.191</td>
</tr>
<tr>
<td>SUSP</td>
<td>-.189</td>
</tr>
<tr>
<td>WCI</td>
<td>.157</td>
</tr>
<tr>
<td>RSES</td>
<td>.142</td>
</tr>
<tr>
<td>BCVI</td>
<td>.122</td>
</tr>
<tr>
<td>ASQBIAS</td>
<td>.106</td>
</tr>
</tbody>
</table>

Note: Predictors listed in descending order of their contribution to discrimination between V and NV.

In this situation, a negative value for a variable indicated that greater values were associated with assignment to the V group, whereas positive scores indicated that higher values were associated with NV group membership. Of particular interest is the finding that increasing values for all of the BPRS psychotic symptom variables were associated with assignment to the
V group. While not providing full support for the hypothesized relation of psychotic symptoms to violent behavior, it does provide some limited support. These findings indicate that the presence of hallucinations was the most important of the symptom variables, and among all variables in general, in discriminating between groups. This is also consistent with the findings of previously mentioned studies (Lowenstein et al., 1990; Werner et al., 1984). Less important among symptom variables was suspiciousness and paranoid ideation.

Among the variables derived from Pathfinder analysis, the number of links within terms of moral content (WCM) were most important in group discrimination. Specifically, this came in the form of more moral links being associated with membership in the nonviolent group.

Again, only one "static" factor emerged as a relatively important discriminating variable, that being nature of the current commitment charge. It was further noted that it was determined to be the second most important among all predictor variables. Given the importance placed upon predictions of future behavior on the basis of past behavior, the fact that current charge
ranked higher than history of violent crime would indicate that one should place greater weight upon more recent past behavior when making short-term predictions. Although only three relatively static factors were included in this analysis (IQ, CHARGE, HVC), these findings do indicate the importance of taking into account more transient variables when making predictions about violence.

Cross-Validation with the Prediction Group

The final test of the accuracy of any discriminant function is in how well the results can be cross-validated, preferably using a separate sample. This was accomplished in the second part of the study by applying the results from the linear discriminant analysis (unstandardized coefficients and constant list in Table 6) to the raw data scores obtained from the sample of 20 new admits. The classification results are presented in Table 9. Of the 20 new admits who participated in the study, it was found that 8 (40%) committed some form of violent act within the first 2 weeks, which was consistent with the previously established base rate for this population (35.6%).
Table 9

Forced Entry Classification Results for the Prediction Group (N=20).

<table>
<thead>
<tr>
<th>Predicted</th>
<th>Violent</th>
<th>Nonviolent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Violent (N=8)</td>
<td>7 (87.5%)</td>
<td>1 (12.5%)</td>
</tr>
<tr>
<td>Nonviolent (N=12)</td>
<td>3 (25.0%)</td>
<td>9 (75.0%)</td>
</tr>
</tbody>
</table>

By applying the discriminant function obtained from the postdiction sample approximately 80% of the prediction sample were accurately classified. Among these, 87.5% of those who engaged in a violent act were accurately predicted to do so. These results are very encouraging, as only one individual who engaged in a violent act was misclassified by this scheme (i.e., false negative of 12.5%). The classification scheme also held constant for the nonviolent group, as 75% of the patients who did not commit a violent act within the first 2 weeks were accurately predicted. The false positive rate obtained for this group (25%) is similar to, if not better than, that reported for previous investigations.

That acceptably high rates of classification were replicated with a separate sample attests to the
reliability of the derived prediction scheme. However, this does not in itself determine that the prediction scheme is indeed a valid and effective predictor of short-term violent behavior. This can be more aptly determined by applying the criteria set forth by Faust and Nurcombe (1989) (as cited in Gouvier, Hayes, & Smiroldo, 1998). Specifically, validity can be established if the rate of true positives divided by the false negative error rate exceeds the false positive error rate divided by the rate of true negatives. However, it should be noted that this method of determining validity does not yield information regarding degree of validity. Effectiveness (accuracy) is demonstrated when the base rate exceeds the combined error rate (false positives + false negatives).

In applying these criteria, it appears that the current scheme is a valid predictor of short-term violence (.875/.125 > .250/.750). The combined error rate (.250 + .125) for the prediction sample was 37.5%. This was only slightly higher (1.9%) than the previously established base rate of 35.6%. While this might indicate that the prediction scheme was statistically "ineffective" at predicting violent behavior within the
pre-study sample (37.5% > 35.6%), we would argue that it could only be considered marginally so.

Specifically, given the assumed confidence interval surrounding the base rate (on the basis of chance factors), it would be safer to conclude that the scheme may indeed be effective at predicting violence. This would in fact be the case if one uses the actual rate of violence occurring in the prediction sample (i.e., 40% > 37.5%), which would suggest the scheme was effective for this group. More importantly, it should be noted that the criteria for establishing the rate of violent behavior in the prediction sample (interviewing patients and staff, daily monitoring) was more thorough than that routinely employed in this setting (i.e., reliability in charting violent behavior). Therefore, if the same methods were used for defining violence in establishing the base rate as were used for defining violence throughout the prediction group, it is likely that the base rate for violence in the facility as a whole would have been increased.

Another important factor should be mentioned here. While it is noteworthy that the prediction equation resulted in only 2.5% error, the finding is viewed as
even more advantageous given that the errors were Type I rather than Type II. Specifically, Type I errors (false positives) predict that an individual will become violent when he actually will not. Type II errors (false negatives) fail to identify an individual as violent when he actually will become violent. The potential costs of the two types of errors differ in that Type II errors may result in harm to an individual due to an unidentified violent patient not being given appropriate supervision. On the other hand, because this type of facility routinely has both the means and the staff available to provide increased supervision of potentially violent individuals, a false positive is likely to only result in minor inconvenience to either the individual or staff.

Therefore, given that the error in the prediction equation resulted in Type I rather than Type II errors, it becomes even more appropriate for use in a forensic facility. Overall, these findings are taken as support for the main study hypothesis, that a combination of predictor variables could be found which would produce a valid and effective classification scheme capable of predicting short-term violent behavior better than base rates alone.
Additional Confirmatory Analyses

As a final test of the predictive ability of the specified variables, a third linear discriminant analysis was conducted wherein membership in the prediction group (V and NV) served as the dependent variable. In other words, we ran the discriminant analysis as if the prediction group (N = 20) were the original sample rather than the cross-validation sample in an effort to examine consistency of previous findings. A list of the means, standard deviations, Wilks' lambda, and significance of univariate F-tests (between prediction groups V and NV) are provided in Table 10.

In comparing these results to those obtained from the discriminant analysis using the postdictive sample (see Table 3), it would appear that the overall pattern of results was maintained with the prediction group. With regard to the STAXI anger data, violent subjects again reported a significantly greater tendency to express their anger through aggression, while reporting a significantly decreased ability to control these expressions. This in turn provides additional confirmation for the study hypothesis regarding the role of anger in violent behavior.
Table 10

Means of Individual Predictor Variables by Prediction Group

<table>
<thead>
<tr>
<th>Predictor</th>
<th>( \overline{V} ) (N=8)</th>
<th>( \overline{NV} ) (N=12)</th>
<th>Wilks’</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANGEX</td>
<td>35.50 (21.27)</td>
<td>20.00 (8.66)</td>
<td>.77578</td>
<td>.04</td>
</tr>
<tr>
<td>ANGCON</td>
<td>20.63 (9.87)</td>
<td>27.83 (2.37)</td>
<td>.74882</td>
<td>.02</td>
</tr>
<tr>
<td>WCV</td>
<td>1.87 (0.64)</td>
<td>1.75 (0.97)</td>
<td>.99432</td>
<td>.75</td>
</tr>
<tr>
<td>WCM</td>
<td>2.13 (1.24)</td>
<td>2.41 (0.90)</td>
<td>.97979</td>
<td>.55</td>
</tr>
<tr>
<td>WCI</td>
<td>1.13 (0.99)</td>
<td>1.67 (1.16)</td>
<td>.93863</td>
<td>.29</td>
</tr>
<tr>
<td>BCVM</td>
<td>3.88 (3.04)</td>
<td>2.00 (2.52)</td>
<td>.88880</td>
<td>.15</td>
</tr>
<tr>
<td>BCVI</td>
<td>3.25 (1.83)</td>
<td>5.33 (2.64)</td>
<td>.82782</td>
<td>.07</td>
</tr>
<tr>
<td>BCMI</td>
<td>3.00 (1.41)</td>
<td>2.17 (2.66)</td>
<td>.96491</td>
<td>.43</td>
</tr>
<tr>
<td>IQ</td>
<td>72.25 (15.12)</td>
<td>86.00 (14.35)</td>
<td>.80987</td>
<td>.06</td>
</tr>
<tr>
<td>RSES</td>
<td>27.00 (7.39)</td>
<td>30.17 (5.88)</td>
<td>.94056</td>
<td>.30</td>
</tr>
<tr>
<td>ASQBIAS</td>
<td>10.25 (9.72)</td>
<td>8.42 (6.99)</td>
<td>.98672</td>
<td>.63</td>
</tr>
<tr>
<td>SUSP</td>
<td>3.87 (2.53)</td>
<td>3.08 (1.93)</td>
<td>.96612</td>
<td>.44</td>
</tr>
<tr>
<td>HALL</td>
<td>3.63 (2.33)</td>
<td>1.33 (1.16)</td>
<td>.67578</td>
<td>.01</td>
</tr>
<tr>
<td>UTC</td>
<td>3.50 (2.33)</td>
<td>2.67 (1.67)</td>
<td>.95370</td>
<td>.36</td>
</tr>
<tr>
<td>CD</td>
<td>3.00 (1.69)</td>
<td>1.83 (1.34)</td>
<td>.85859</td>
<td>.10</td>
</tr>
<tr>
<td>HVC</td>
<td>0.38 (0.52)</td>
<td>0.42 (0.52)</td>
<td>.99826</td>
<td>.86</td>
</tr>
<tr>
<td>CHARGE</td>
<td>0.13 (0.35)</td>
<td>0.42 (0.52)</td>
<td>.90278</td>
<td>.18</td>
</tr>
<tr>
<td>RESPSTYL</td>
<td>1.00 (0.00)</td>
<td>0.67 (0.49)</td>
<td>.83333</td>
<td>.07</td>
</tr>
</tbody>
</table>

Note: For HVC, the mean reflects the proportion of cases not having a history of violent crime; for CHARGE the proportion of cases not having a violent commitment charge; for RESPSTYL, proportion of cases using a full-scale response style.
In looking at the data obtained from Pathfinder analysis, there were a few noted differences between the two samples. There were no longer significant differences between groups (V and NV) in terms of the number of links within moral terms (WCM). Rather, the difference between groups in terms of the number of links between words of violent and immoral content (BCVI) appeared much larger, although lacking statistical significance ($p=.07$). This is somewhat more in line with what was expected (that NV would make more links between violent and immoral words than V). Given the closer temporal relationship between moral associations and violent behavior in the prediction sample, it is possible that the finding could be better substantiated with a larger sample.

With respect to the BPRS psychotic symptom variables, the results obtained with the postdiction sample were replicated with the prediction sample (i.e., the only significantly different symptom between V and NV was hallucinatory behavior). A closer inspection of the data using a oneway analysis of variance (ANOVA) revealed that subjects from the prediction sample who actually became violent were experiencing significantly more
hallucinations than violent subjects from the postdiction sample (p=.02). This is an interesting finding, in that it demonstrates the importance of hallucinations in violent behavior as well as the stability of this particular symptom.

The only noticeable change on the two demographic factors (CHARGE and HVC) was that the V and NV groups were no longer significantly different in terms of the nature of the current charge. In essence, nonviolent subjects were just as likely as violent subjects to have been committed on a violent offense. Also, there were again no significant differences between violent and nonviolent patients in regards to externalizing attributional style or reported self-esteem.

Of greater relevance is the classification scheme obtained by running the linear discriminant analysis, using all predictor variables, on the prediction sample. The results are listed in Table 11. Surprisingly, an overall 100% correct classification rate was obtained when using all available predictors in a forced entry discriminant analysis with the prediction group. That no errors were made suggests that, by using a combination of all the self-report and historical variables, a valid and
effective prediction scheme for violent behavior can be devised.

Table 11

Classification Results for the Forced Entry Linear Discriminant Analysis Using the Prediction Group (N=20)

<table>
<thead>
<tr>
<th>Predicted</th>
<th>Violent</th>
<th>Nonviolent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent (N=8)</td>
<td>8 (100.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Nonviolent (N=12)</td>
<td>0 (0.0%)</td>
<td>12 (100.0%)</td>
</tr>
</tbody>
</table>

This stands in contrast to the classification rate obtained by applying the results of the postdiction discriminant analysis to the prediction group, which would suggest that a more valid approach would be to take into account the temporal relationship between self-report and behavior. Nonetheless, that a high classification rate was obtained with the postdiction data does attest to the stability of individuals' self-report in the assessed domains.

Lastly, since this was the first study known to us to examine the use of Pathfinder in violence prediction, an additional analysis was conducted to further explore the hypothesized relationship between short-term violent
behavior and associations between violent and moral terms and violent and immoral terms. Specifically, it had been predicted that the violent patients would make more associations (links) between terms of violent and moral content as opposed to terms of violent and immoral content, whereas nonviolent patients would make associations in the opposite direction. It was also expected that violent patients, in comparison to nonviolent patients, would make more associations between violent and moral terms and fewer associations between violent and immoral terms.

This set of hypotheses was examined in the following manner. First, all participants with a history of short-term violent behavior (from both prediction and postdiction samples) and all participants without a history of short-term violent behavior were condensed to form two groups; violent (N=48) and nonviolent (N=52). Next, a multivariate analysis of variance (MANOVA) using Pathfinder data (BCVI and BCVM) and the newly formed group (violent vs. nonviolent) was conducted. It was found that there was no significant effect for group (F[1,98]=2.08, p=.153), although there was a significant difference in the number of links between violent and

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immoral terms compared to violent and moral terms \( (F[1,98]=19.50, p=.000) \). There was no significant interaction effect between group and type of associations (BCVI vs. BCVM) \( (F[1,98]=.05, p=.830) \). Specifically, all participants, regardless of their actions during the first 2 weeks of admission, made significantly more associations between words of violent and immoral content than between words of violent and moral content. These findings failed to support the hypotheses in question. However, it would be inappropriate at this time to make a determination regarding the usefulness of Pathfinder within a forensic setting as the population under study has not been compared to a non-forensic control group for differences in associative networks surrounding concepts of violence and morality. Because the entire sample was for various reasons involuntarily hospitalized, there may have occurred a restriction in range, limiting conclusions regarding Pathfinder in this setting.
Discussion

The present study expanded upon previous prediction studies of violent behavior in a number of ways. First, it examined the short-term prediction of violent behavior among forensic inpatients, whom by the very nature of their situation (arrest for violent crime, danger to self and/or others) are at a much higher risk for engaging in violent behavior. It also examined the contribution of individuals' self-reported anger to violent behavior, as well as the patients' associations between categories of moral, immoral, and violent content. Moreover, it incorporated information regarding the known local base rate for violent behavior when making decisions about the validity and effectiveness of the resulting predictions.

The present study also utilized a unique design for testing out the ability of a combination of static (historical) predictor variables and more transitory variables obtained through self-report. This was accomplished through a postdictive phase, which examined the ability of patients' current self-report on available measures to differentiate them in terms of their past behavior (violent vs. nonviolent during the first 2 weeks of admission). These results were then cross-validated.
in a predictive phase using a sample of newly admitted patients. While these methods have often been used separately in violence prediction research, this was the first time known to us that they had been combined within a single study.

Since this was the first study known to us to investigate several of the predictive factors, a number of hypotheses were made about the individual predictors. The first of these concerned the relationship between anger and short-term violence. Despite the one study showing a strong relationship between anger and physical violence (Kay et al., 1988), and that the relationship between anger and aggression is commonly acknowledged, it was noted that recent investigations have ignored the contribution of anger in predicting violent behavior (Novaco, 1994). Based upon this and the theory that anger serves as a significant activator for aggressive behavior (Novaco & Renwick, 1998), it was hypothesized that patients exhibiting violent behavior during the first 2 weeks of admission would report a greater tendency to express anger as compared to those patients who did not exhibit violent behavior. It was also hypothesized that nonviolent patients would report a
greater ability to control these expressions of anger than violent patients.

This set of hypotheses was confirmed using participants' self-report on the STAXI anger expression and anger control subscales. Significant differences between violent and nonviolent participants on both of these subscales were found in both the postdiction and prediction sample. Moreover, an examination of the structure matrix revealed these two factors to be relatively important in discriminating between patients who would and would not engage in a violent act early in the course of admission (3rd in order of contribution for ANGCON and 5th for ANGEX). These findings revealed the importance of patients' perceived ability to modulate their outward expressions of anger. This also indicates the importance of relying upon patients' self-report, given that patients in the prediction group who soon went on to commit a violent act had rated themselves as more likely to express their anger through aggressive means.

In keeping with current research efforts, the present study focused on studying the possible effects of specific psychiatric symptoms, rather than broad diagnostic categories, in predicting violent behavior.
Despite Norko’s (2000) contentions that contradictory findings limit the conclusions one can make about the relationship between psychiatric symptoms and diagnoses, several investigators have reported a relationship between specific symptoms (primarily hallucinations) and short-term inpatient violence (e.g., Lowenstein et al., 1990; Werner et al., 1984). In order to help clarify the relationship between psychosis and violent behavior, the primary psychotic symptom variables from the expanded BPRS (hallucinations, unusual thought content, suspiciousness, conceptual disorganization) were examined in this study, with the expectation that higher levels of each would be associated with violent behavior. While there was a trend for violent patients in both the postdictive and predictive samples to be rated higher on these symptoms, the only one for which they significantly differed from nonviolent patients was hallucinations. More importantly, the results showed that the presence of hallucinations was the most important among all examined variables for predicting short-term violent behavior.

The current finding of a predictive relationship between hallucinations and short-term inpatient violence lends additional support to the studies of Lowenstein et
al. (1990) and Werner et al. (1984). It was also noted that hallucinations were again the most important predictor when a discriminant analysis was conducted on the prediction sample, which attests to the stability and importance of this symptom. Interestingly, those patients in the postdiction sample who had been violent during the first 2 weeks of admission were still experiencing significantly (p=.01) more hallucinations (at a later point in time) than those who had not been violent. This would seem to indicate the relative stability of hallucinations and poorer response to standard treatments.

It was hypothesized that individuals exhibiting a more "external" attributional style (attributing blame to others for negative outcomes while attributing positive outcomes to one's own actions) would be more prone to engage in violent behavior. This was based upon the assumption that such individuals would be more likely to feel badly toward, and thus angry at, the perceived source of blame in an effort to preserve self-esteem (i.e., see oneself as blameless), and thus ward off depressed mood. Conversely, it would be expected that individuals with an internal attributional style would be
more likely to blame themselves and not others, and thus
be less likely to feel anger towards others for negative
outcomes. This hypothesis was not confirmed in the
present study, as there were found no significant
differences in the degree of attributional bias (external
style) on the ASQ between violent and nonviolent patients
in either the postdiction or prediction samples.
Moreover, there were no significant differences between
these groups in terms of self-esteem as reported on the
RSES.

One possible explanation for the lack of significant
findings with the ASQ is in the nature of the measure
itself. Specifically, the ASQ asks respondents to
imagine that a hypothetical scenario has occurred, as
opposed to some real event. Participants' responses to
hypothetical scenarios may not accurately reflect how
they would respond to more personally relevant real-life
scenarios, thus bringing into question the external
validity of the measure. Moreover, the modest levels of
alpha typically found for the composite scales of the
measure indicate a relative lack of internal reliability
(e.g., Reivich, 1995). Thus, it may be that differences
do exist in external attributional style between violent
and nonviolent patients but unable to be detected with
the currently available measure.

Another explanation for these findings can be found
by examining the means on the ASQ and RSES for all
patients. It was noted that all patients had average ASQ
bias scores that were positive. In essence, a positive
bias score reflects an external attributional style
whereas a negative score would reflect an internal style
(i.e., bias score = ASQ positive items - ASQ negative
items). Also, patients' score on the RSES were noted to
be in the higher end of the range (approximately 30 out
of 40 possible points), which is consistent with recent
findings using a large (N=193) undergraduate population
(M=34.1, Martin & Penn, in press). This indicates that
both violent and nonviolent patients exhibited levels of
self-esteem similar to non-patients, as well as an
external attributional style. It was also noted that
both groups had a recent history of violent behavior
(i.e., 70% of nonviolent group had a commitment charge
involving a violent offense, 60% had a previous history
of arrest for violent crime). It may therefore be that
an external attributional style and high self-esteem do
in fact contribute in some manner to violent behavior,
but are less useful as predictors for violent behavior in the short term.

It was earlier noted that studies have been inconsistent in their findings of associations between low intelligence and violent behavior (Brizer, 1989), although it appears that overall there have been more studies supporting this relationship (Holland et al., 1981; Klassen & O'Connor, 1987, 1994; Lewis et al., 1979). Given the ambiguity surrounding this matter, it was decided to incorporate estimates of IQ into the present study in hopes to clarify the relationship. It was also hypothesized that violent patients would exhibit lower IQ than nonviolent patients, given that more studies have supported this position. Among the postdiction sample it was found that there were no significant differences between groups in terms of IQ scores on the SILS. However, in looking at these scores it was noted that patients in both groups had average IQ scores in the Borderline range of intelligence. Given the previously mentioned findings of high levels of more recent violent behavior among the "nonviolent" postdiction sample, this may provide some limited confirmation for the hypothesized relationship in that
individuals of lower intellectual functioning are more prone to express themselves in a violent manner overall. Slightly better confirmation for this hypothesis comes in the finding of near-significant differences between violent and nonviolent patients in the prediction sample. In looking at these scores, it was found that patients who soon became violent had an average IQ in the Borderline range, whereas those patients who did not become violent had a mean IQ in the Low Average range. Also, it was noted that IQ contributed more to the discrimination of violent from nonviolent in the prediction sample, although this finding lacked statistical significance.

While the findings regarding IQ between these two samples may appear contradictory, it is posited that the nature of participants in the postdiction sample may in part provide some explanation. Specifically, it should be noted that nonviolent patients in the postdiction sample, like their more violent counterparts, had been hospitalized for a longer period of time. It may be that lower intellectual functioning was contributing to prolonged hospitalization in this sample (e.g., longer time to be restored to competency), whereas nonviolent
patients with higher intellect were discharged in a shorter time (e.g., more likely to be found competent, less danger to self and others). Unfortunately, the design of this study did not permit a more thorough examination of this issue. Nonetheless, these results seem to provide some limited evidence for a relationship between low IQ and violence overall, as well as the importance of considering IQ in making short-term predictions of violence.

The last set of hypotheses involving individual predictors dealt with patients' associations between violence and morality. Although no studies have examined the influence of such associations in predicting violence, it has been theorized that a lack of "moral emotions" may underlie the actions of individuals prone to such behavior (Dinitz, 1978; Monahan, 1981). Specifically, it has been postulated that individuals lacking in moral development are more likely to lack semantic associations between violence and immorality, in essence they would fail to see a violent act as being "wrong." This was examined in the present study using a methodology capable of examining patients' associative networks based on their ratings of relatedness of
concepts (Pathfinder; Schvaneveldt, 1990). Using violent, moral, and immoral concepts, it was hypothesized that nonviolent patients would make more associations between violent and immoral terms than violent and moral terms. Since violent patients presumably lack in moral emotions, it was expected they in turn would make more associations between violent and moral terms than between violent and immoral terms. Moreover, it was expected that violent patients would make fewer links between violent and immoral terms, and more links between violent and moral terms, than nonviolent patients.

These hypotheses were not supported in the present study, as it was found that all patients made significantly more associations between violent and immoral terms as compared to associations between violent and moral terms. However, a couple of points bear mention. As stated earlier, it remains unknown how this sample would compare to a base line control group of non-patients. Additionally, among patients in the postdiction group, nonviolent patients made significantly more associations among words of moral content than did violent patients. This would suggest that nonviolent patients have denser associative networks for groups of
concepts reflecting morality. This finding was not replicated with the prediction sample, although it was found within this group that nonviolent patients tended to make more associations than violent patients between violent and immoral terms, although this finding was not statistically significant. Moreover, the discriminant analysis conducted on the prediction sample revealed the number of associations between violent and immoral terms to be a relatively important predictor (5th in order of contribution). The findings from the prediction group suggest the relative importance of including associative networks, which would argue for replication of these findings with a larger sample of new admits.

While the violent and nonviolent patients did not significantly differ on the majority of these predictor variables, the inclusion of these variables into an overall prediction equation was found to be necessary for valid and accurate classification. This was the main hypothesis of this study, that a combination of self-report and historical variables could be used to maximize accurate identification of true cases while minimizing error. It was found that inclusion of all identified variables resulted in a true positive rate of 72.5% and a
true negative rate of 70%, with an error rate of 30% false positives and 27.5% false negatives for the postdiction sample. These rates were far more accurate than those obtained with the two most statistically significant predictors (32.5% true positive and 67.5% false negative rates).

When the full equation was applied to the prediction sample, it was found that patients were more accurately predicted on the basis of their subsequent behavior (87.5% true positive and 12.5% false negative, with 75% true negative and 25% false positive). The resulting scheme was determined to be valid for predicting violent behavior within the first 2 weeks of admission. There were also indications that the prediction scheme was effective in this regard, as the combined error rate closely approximated the established local base rate for violent behavior. In other words, the combined error rate for the prediction scheme was found to be at an acceptably low level, as it did not exceed the established base rate for violent behavior, thus attesting to the accuracy of the prediction scheme (i.e., Faust & Nurcombe, 1989).
The finding that the prediction group was more accurately classified than the postdiction group was somewhat unexpected. More precisely, in much the same way that $R^2$ in multiple regression analysis is considered to be an overestimate, so to is the initial classification obtained in discriminant analysis (Norusis, 1988). Thus, it would be expected that less accurate classification rates would have been obtained with the prediction sample. Furthermore, when a discriminant analysis using the same variables was conducted on the prediction group, 100% correct classification was obtained.

While it is feasible that the relatively small size of the sample contributed to this finding, taken together these findings suggest that there may be differences between the postdiction and prediction groups contributing to these differences. Most obvious is the fact that individuals in the postdiction sample were being classified in terms of their past behavior on the basis of their current report. In using a postdictive design an assumption must be made that current self-report would accurately differentiate individuals in terms of their past (violent) behavior. However, it is
entirely possible that some interventions had taken place which may have changed their standing on certain variables since admission (e.g., being taught anger management skills). Another important consideration, as previously mentioned, is that individuals in the postdiction sample have been institutionalized for a longer period of time. There may be something about these individuals that has contributed to a more prolonged stay (e.g., lower IQ impeding competence to stand trial), and as such makes them less representative of the prediction sample. Regardless, that the current prediction scheme possessed greater validity and efficacy for the prediction sample indicates the need to conduct a larger study using only newly admitted patients.

In looking at the results of the current study, some important points should be made. First, a large proportion of the instruments used relied upon the patient’s self-report (e.g., RSES, STAXI, BPRS). That patients who soon became violent had reported experiencing more hallucinations and rated themselves as being more prone to aggression and lacking in control of their aggression attests to the reliability of their self-report. That, and the short time required to
administer the measures (approximately 1.5 hours) makes this scheme potentially useful and practical in a clinical setting.

The results of this study also provide implications for interventions in this setting. While it is understood that historical factors cannot be changed (i.e., nature of charge, previous arrest for violent crime) and that certain factors are more static in nature and less easily modified (i.e., intelligence), other factors can be changed through intervention. The first concerns the findings from the STAXI concerning patients' anger. The relative importance of patients' perceived inclination to express their anger and ability to control these expressions would indicate a useful point for intervention.

The findings with respect to hallucinations also have implications for therapeutic interventions. Given that hallucinations were the factor most strongly and consistently linked to violent behavior would argue for interventions targeting this symptom. This is almost exclusively accomplished in this type of setting through the use of antipsychotic medications (e.g., Risperdal, Haldol), given the predominant biological theories
regarding the nature of these symptoms (e.g., Mednick, 1998). However, there was no statistically significant difference between violent and nonviolent patients in terms of medication status, and previously violent individuals in the postdiction sample continued to report significantly greater hallucinations. This would seem to indicate that conventional psychotropic interventions are less effective for this particular symptom, at least for this subset of patients. This is not surprising, given that estimates for the efficacy of traditional antipsychotics in treating positive symptoms is around 60%, and that 30% of cases are unresponsive to these treatments (APA, 1997). While it is beyond the scope of this study to propose new pharmacological treatments, there have been recent advances in adjunct psychological interventions targeting treatment refractory hallucinations. For example, Bentall, Haddock, and Slade (1994) have reported preliminary results suggesting that a cognitive-behavioral approach called "focusing" (i.e., exploring the content of and beliefs about the hallucinations) may be effective in reducing the severity and frequency of auditory hallucinations. This may prove

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to be a useful area for future research efforts aiming to reduce violent behavior and/or potential for violence.

While the current findings are very encouraging, a few limitations are in need of mention. First, as was earlier noted, potential differences between the postdiction and prediction samples may have obscured relevant findings. More firm conclusions might be drawn by conducting the same study with just newly admitted patients. Second, patients who participated in this study were selected on the basis of their ability to participate in the study, complete the selected measures, and who were not under suspicion for malingering. Also, participation in the study was voluntary, and it was observed that a couple of patients who refused to participate eventually engaged in violent behavior. As such, any conclusions about the reliability of patient self-report, as well as the efficacy of this prediction scheme, is limited to a specific subset of patients. Specifically, this would include those patients who are not too overtly psychotic and disorganized, too limited in their intellectual functioning, have a low probability for malingering, and who are willing to cooperate. Unfortunately, due to the design of this study no
conclusions can be drawn about those patients who were either unable or unwilling to participate. Future studies may need to focus efforts on these types of patients and their propensity for violent behavior.

There are some potential limitations that might explain the overall lack of expected findings with Pathfinder and associative networks. It is possible that the content words used in this study were not fully representative of the domains they were intended to reflect (i.e., moral, immoral, violent). It may be useful to conduct a more in-depth analysis of these areas to obtain a more representative sample of words. Unfortunately, the nature and design of the Pathfinder task did not permit an analysis of the internal consistency (Cronbach's alpha) of the respective domains. Also, the number of words used for each content area may have been too small to reveal significant findings. Future research efforts employing this task may therefore need to increase the sample of content words.

Lastly, with regard to associative networks, relevant clinical observations may provide some explanation for the lack of findings. Specifically, it has been noted that individuals who reported engaging in
a violent act secondary to "command" hallucinations will often report that they knew the act was "wrong", but felt they had no choice. In essence, it may be that they had proper associations between "violence and immorality", and indeed "perceived" their behavior as both violent and immoral, but felt compelled to perform the act anyway (i.e., the irresistible impulse or diminished capacity clauses that are recognized in most states). It is very important to note that this is not to be confused with the existing legal standards for insanity (i.e., the McNaughten rule regarding ability to distinguish right from wrong). Nonetheless, this is a relationship that should be considered in future violence prediction studies.

Another limitation of this study was in the type of information collected about symptoms. While focusing on specific symptoms proved to be more beneficial than focusing on broad diagnostic categories, it may be that even more specific information is needed. The ratings made on the Expanded BPRS only incorporated information about the frequency and severity (interference with functioning) of the symptom. In the case of hallucinations, information about the exact nature of the
hallucinations was not obtained (e.g., auditory or visual). This renders the conclusions limited to hallucinations per se, resulting in relevant information about the relationship between the type and content of the hallucination and violence being lost. It may be that hallucinations with specific content (e.g., hallucinations instructing one to harm self or others) are more strongly related to engaging in violent behavior. It is therefore recommended that future studies in violence prediction incorporate this information into their designs.

In conclusion, it was found that through a combination of available and commonly used self-report measures and easily obtained historical variables, valid and accurate predictions could be made about the likelihood of a subset of forensic inpatients to engage in violent behavior within the first 2 weeks of admission. Future research efforts may wish to apply these methods to different populations (e.g., non-forensic psychiatric inpatients, community outpatient populations) and examine the ability of this method to predict violence over the long-term.
References


### Appendix A

**Terms for Pathfinder Relatedness Ratings Task**

<table>
<thead>
<tr>
<th>Violent</th>
<th>Moral</th>
<th>Immoral</th>
</tr>
</thead>
<tbody>
<tr>
<td>punch</td>
<td>good</td>
<td>bad</td>
</tr>
<tr>
<td>kill</td>
<td>right</td>
<td>wrong</td>
</tr>
<tr>
<td>fight</td>
<td>okay</td>
<td>not okay</td>
</tr>
</tbody>
</table>
Appendix B
Demographics Form

Demographics Information

Code # _________

Status: Pretrial NGBRI LVA Civil

Age _________ Race ___________

Education ___________

Current charge or conviction

______________________________

Victim information: age _________, sex _________, relationship ________________ Race ________
Predatory? Yes No

History of Violent crime? Y N

______________________________

Psychiatric Diagnosis

______________________________

Meds

______________________________

Violence two weeks post admission? Yes No
Type: Threats Object Person
Physical Object Person
Appendix C

Consent Form

1. **Title:** Predicting Short-term Violence Among Forensic Inpatients

2. **Where:** Eastern Louisiana Mental Health System Forensic Division

3. **Contacts:** If you have questions, you may contact the following individuals Monday through Friday between the hours of 8:00 a.m. and 6:00 p.m.

   Dr. David Hale Mac Martin
   ELMHS Forensic Division Louisiana State University
   Phone: 225-634-2661 ext. 65 Phone: 225-665-1903

4. **Purpose of the Study:** To see how patients in a forensic hospital score on tests to predict violence.

5. **Participants:** This study is open to all males who have been committed by the courts to the Forensic Division. Males who are currently experiencing severe psychological problems will be unable to participate.

6. **Number of Participants:** 100 patients at the Forensic Division will be used in this study.

7. **Procedures:** This study will use those tests which are normally used at the Forensic Division and one word relatedness task in which you will be asked to decide how related pairs of words are. You will first be asked about any psychological problems you may or may not have, such as feeling nervous, feeling sad, or hearing voices. You will then be asked to complete some tests which will be read to you asking about your feelings and opinions. The whole study will take one hour of your time. If you have just been admitted, you will also be asked each day if you have been involved in any violent
activity, which will take about five minutes each day for two weeks.

8. **Benefits:** This study will benefit you because you will get $4.00 for completing the study. The other benefit is that you will be helping us understand how people at a forensic hospital score on tests predicting violence.

9. **Risks:** There are no risks for doing this study. However, there is a possibility that you might feel emotional discomfort about answering questions of a personal nature. If you should feel uncomfortable, you can refuse to answer questions or stop the study at any time.

10. **Right to Refuse:** You do not have to do this study if you do not want to. You can also stop doing the study at any time. Your decision to not do the study or stop the study will not affect your treatment at this facility or get you in trouble with staff. You will not be punished in any way or lose points on the Level system.

11. **Privacy:** The information we get from you will only be used for this study, and is not to be used by the courts or for your treatment at Forensic Division. Your name will not be placed on any forms except the consent form, and this will be kept in a different file. That way, no one will know who you are or how you did on these tests. Only the people listed above will be able to look at your answers. After the study, we will destroy all of these forms, so no one will know you did the study. HOWEVER, if you indicate that you have thoughts of hurting yourself or others, your psychiatrist WILL be notified.

12. **Financial Information:** You will be paid four (4) dollars upon completion of the entire study. This money will be directly deposited to your patient account.

13. **Alternatives:** The alternative is not to participate in this study.
14. **Release of Information:** I will need to look through your chart to get additional information about you, such as your age, diagnosis, and current medications.

15. **Signatures:** The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Charles E. Graham, Chairman, LSU Institutional Review Board, at 225-388-1492. I agree to participate in the study described above and acknowledge the researcher's obligation to provide me with a copy of this consent form if signed by me.

<table>
<thead>
<tr>
<th>Signature of the Patient Volunteer</th>
<th>Date</th>
</tr>
</thead>
</table>

"The study subject has indicated to me that he is unable to read. I certify that I have read this consent form to the subject and explained that by completing the signature line above, the subject has agreed to participate."

<table>
<thead>
<tr>
<th>Signature of Reader</th>
<th>Date</th>
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<table>
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<tr>
<th>Signature of Witness</th>
<th>Date</th>
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<table>
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<tr>
<th>Signature of Investigator</th>
<th>Date</th>
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Vita

Mac Marcantel Martin was born and raised in rural central Louisiana, and identifies her cultural and ethnic background as Cajun. She served on active duty in the U.S. Marine Corps during the Persian Gulf War, and after serving her country went on to pursue higher education while maintaining the responsibility of raising a family. Her professional interests include human sexuality and forensic and legal issues in psychology. She has recently obtained an administrative and clinical position as Director of Counseling and Student Services at the North Georgia College and State University, where she hopes to use her education and training to help others meet their educational and personal needs and goals. In her spare time she enjoys spending time with her family, spending time outdoors, fishing, and sailing.
DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Mac Marcantel Martin

Major Field: Psychology

Title of Dissertation: Predicting Short-Term Violence Among Forensic Inpatients

Approved:

[Signatures]

Major Professor and Chairman
Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination:

04/17/01