THE RELATIONSHIP OF INTIMATE PARTNER AGGRESSION TO HEAD INJURY, EXECUTIVE FUNCTIONING, AND INTELLIGENCE

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Measures of head injury, executive functioning, and intelligence were given to a community sample composed of 102 male perpetrators of intimate partner aggression (IPA) and 62 nonaggressive men. A history of head injury and lower mean score on a measure of verbal intelligence were associated with the frequency of male-perpetrated physical IPA as reported by male perpetrators and their female partners. Lower mean scores on a measure of verbal intelligence also predicted frequency of psychological IPA perpetration. Using the perpetrator subtypes outlined by Holtzworth-Munroe et al. (2000), analyses revealed that compared with other groups, the most severely aggressive subtypes (i.e., borderline-dysphoric and generally violent-antisocial) were the most likely to report a history of head injury and to have significantly lower mean scores on a neuropsychological test of verbal intelligence. The possible role of neuropsychological factors in IPA perpetration and implications for prevention and intervention programs are discussed.

Male aggression against intimate female partners is a major public health problem, with approximately 1.5 million women physically assaulted and/or raped by an intimate male partner in the United States annually (National Center for Injury Prevention and Control, 2003). The deleterious effects of physical and psychological intimate partner aggression (IPA) in intimate relationships are well established in the research literature (Campbell, 2002). A large research base has identified numerous risk factors that differentiate aggressive from nonaggressive male partners, such as socioeconomic status, education, history of abuse or exposure to violence in childhood, elevated levels of anger and hostility, psychopathology, substance abuse,
social skills deficits, and attitudes that condone aggression (Holtzworth-Munroe, Bates, Smutzler, & Sandin, 1997; Schumacher, Feldbau-Kohn, Smith Slep, & Heyman, 2000; Stith et al., 2000). Several researchers have also attempted to distinguish between subtypes of aggressors based on multivariate models of well-established risk factors such as psychopathology and general aggression (e.g., Chase, O'Leary, & Heyman, 2001; Holtzworth-Munroe et al., 2000; Waltz, Babcock, Jacobson, & Gottman, 2000). The current project seeks to increase the knowledge base related to IPA by (a) examining the relationship between performance on neuropsychological measures and the frequency of IPA perpetration and (b) examining differences in neuropsychological performance across subtypes of male perpetrators.

Previous inquiry into the neuropsychological bases of both general aggression and IPA indicates that neuropsychological abnormalities play a key role in aggression and potentially related problems such as antisocial personality disorder and criminality (Brower & Price, 2001; Cohen et al., 2003; Glenn & Raine, 2008; Siever, 2008). Evidence also indicates that different types of aggression may have distinct neuropsychological underpinnings. For example, individuals who are impulsively aggressive have lower mean scores on tasks measuring executive functioning (Villemarette-Pittman, Stanford, & Greve, 2003), whereas individuals who engage in premeditated aggression do not (Stanford, Houston, Villemarette-Pittman, & Greve, 2003). The current study assesses neuropsychological correlates of IPA frequency and compares performance on neuropsychological measures across empirically validated subtypes of IPA perpetrators (Holtzworth-Munroe et al., 2000). Specifically, participants were assessed in three domains: (a) history of head injury, (b) executive functioning, and (c) intelligence.

HEAD INJURY

Head injuries are a common cause of the neuropsychological abnormalities indicated in general aggression (Siever, 2008; Tateno, Jorge, & Robinson, 2003) and are overrepresented in antisocial and criminal populations (Brower & Price, 2001). Using the Head Injury Questionnaire (Rosenbaum & Hoge, 1989), which includes questions on history of loss of consciousness or concussion and assesses head injury–related diagnosis, symptoms, and medical treatment, Rosenbaum and colleagues conducted a series of studies exploring the relationship of head injury to IPA. In their initial study, they found that 61% of men referred to an IPA treatment program reported a history of head injury (Rosenbaum & Hoge, 1989). Two later studies indicate that compared with nonaggressive control groups, men with a history of IPA perpetration were twice as likely to report a history of head injury (Cohen, Rosenbaum, Kane, Warnken, & Benjamin, 1999; Rosenbaum et al., 1994). When head-injured men were compared with men with other types of injuries, the head-injured men engaged in higher levels of psychological IPA (Warnken, Rosenbaum, Fletcher, Hoge, & Adelman, 1994).

EXECUTIVE FUNCTIONING

Much attention has been paid to the prefrontal cortex as a critical substrate for aggression, specifically the role of executive function in such capabilities as future-oriented planning, self-regulation, self-awareness, and intentionality (Damasio, Grabowski, Frank, Galaburda, & Damasio, 1994; Siever, 2008). Damage to the prefrontal cortex can result in executive function deficits with a range of functional manifestations, such as personality changes, behavioral disinhibition, increased impulsivity, and lability (Chambers et al., 2006; Damasio et al., 1994), all of which can impact the likelihood of IPA. Previous work with this sample indicated the importance of impulsivity as a correlate of IPA, particularly among the most severely aggressive subgroups of male perpetrators (Holtzworth-Munroe et al., 2000).

Studies using neuropsychological assessment tools to evaluate executive functioning have demonstrated impaired performance among IPA perpetrators compared to nonaggressive control groups. Cohen et al. (1999) found that performance on neuropsychological measures was a stronger correlate of IPA perpetration than a history of head injury or emotional distress. Similarly, Schafer and Fals-Stewart (1997) found neuropsychological assessment variables to be better predictors of severe IPA than demographic variables or measures of anxiety, anger, and
Neuropsychological assessment tools sensitive to executive functioning, such as the Trail Making Test part B (TMT B; Lezak, Howieson, & Loring, 2004) and the Wisconsin Card Sort Test (WCST; Anderson, Damasio, Jones, & Tranel, 1991), have been related to IPA, whereas measures not sensitive to executive function, such as the Trail Making Test part A (TMT A), do not appear to be related to IPA perpetration (Schafer & Fals-Stewart, 1997; Stanford, Conklin, Helfritz, & Kockler, 2007; Teichner, Golden, Van Hasselt, & Peterson, 2001). The findings from several studies indicate that men with a history of IPA perpetration have slower completion times and make more errors on TMT B, which is a test designed to assess cognitive flexibility and the ability to inhibit automatic responses (Schafer & Fals-Stewart, 1997; Stanford et al., 2007). There is also evidence that IPA perpetrators make more errors and are more likely to fail to adjust their response strategy based on examiner feedback on the WCST compared with nonaggressive matched controls (Stanford et al., 2007; Teichner et al., 2001). The WCST measures impulse control, planning, goal-directed behavior, and the ability to utilize environmental feedback to construct a problem-solving strategy.

It is important to note that there is some variation in findings related to neuropsychological assessment of executive functioning. For example, one study found that IPA perpetrators made more errors and took more time on the TMT B; however, no group differences emerged on other tests of executive function, including the WCST (Westby & Ferraro, 1999). Other studies demonstrate impairment in only certain aspects of the WCST. For example, IPA perpetrators had a higher number of failures to maintain set (i.e., observe and adopt an effective problem-solving strategy) than the control group, but did not differ in the number of errors or the number of categories completed (Stanford et al., 2007). This suggests that components of executive function, such as the ability to integrate information from the environment that is necessary to maintain set on the WCST, may be relative deficits among IPA perpetrators. Further research may serve to clarify these relationships, specifically whether differences in findings related to performance on executive function measures may be accounted for by subtypes of IPA perpetration.

INTELLIGENCE

Intelligence has also been implicated in studies of aggression, although clearly not all aggressive individuals have intellectual impairment. Cohen et al. (1999) found that IPA perpetrators had lower mean scores than nonaggressive men on the Shipley tests (Shipley, 1946) of abstract and verbal intelligence. Verbal intelligence may be particularly related to general aggression (Vitacco, Neumann, & Wodushek, 2008) and IPA perpetration (Cohen et al., 2003; Schafer & Fals-Stewart, 1997; Westby & Ferraro, 1999). Language skills are essential to successfully negotiating stressful interpersonal situations without aggression, and the relationship between poor communication skills and IPA perpetration is well established in the literature (Babcock, Waltz, Jacobson, & Gottman, 1993). Low intelligence, particularly low verbal intelligence, may underlie the communication skills deficits associated with IPA perpetration.

SUMMARY AND HYPOTHESES

Existing research indicates that a history of head injury and lower mean performance on measures of executive functioning and intelligence are related to IPA perpetration. However, this literature base is limited by the use of relatively small sample sizes (Easton, 2008; Stanford et al., 2007) and samples with restricted generalizability, such as men court-ordered to IPA treatment (Stanford et al., 2007) and men undergoing treatment for substance dependence (Easton, 2008). The research base would be improved by the inclusion of psychological IPA as an outcome (in addition to physical IPA), the use of partners' collateral reports of IPA frequency, and an examination of neuropsychological correlates among subtypes of IPA perpetrators.

Prior research with this sample has produced four validated subtypes of IPA perpetrators that remain consistent over time (Holtzworth-Munroe, Meehan, Herron, Rehman, & Stuart, 2003; Holtzworth-Munroe et al., 2000): (a) Family-only perpetrators engage in low levels of IPA and general aggression (i.e., extrafamilial aggression) and evidence little or no
psychopathology and low levels of substance abuse. (b) Low-level antisocial perpetrators engage in moderate IPA and general aggression and score in a moderate range on measures of antisociality and substance abuse. (c) Borderline-dysphoric perpetrators engage in moderate to severe IPA, low to moderate general aggression, and moderate to high substance abuse and evidence psychological distress and borderline personality characteristics. In addition, borderline-dysphoric perpetrators exhibit accepting attitudes toward violence, hostile attitudes toward women, and high levels of jealousy and impulsivity. (d) Generally violent-antisocial perpetrators engage in moderate to severe IPA and high levels of general aggression and substance abuse and have substantial antisocial personality characteristics. Generally violent-antisocial perpetrators also exhibit accepting attitudes toward violence and hostile attitudes toward women, along with high impulsivity and a dismissing attachment style. Please see Holtzworth-Munroe et al. (2000) for a complete description of the perpetrator subtypes.

The current study builds on existing knowledge of neuropsychological correlates of IPA perpetration by examining physical as well as psychological IPA, a relatively large community sample, and two comparison groups of nonviolent men. First, we hypothesized that a history of head injury, lower mean scores on measures of executive function, and low general and verbal intelligence would be associated with greater frequency of physical and psychological IPA perpetration and that the neuropsychological correlates would prove to be more robust predictors of IPA frequency than demographic factors such as age, income, and education. Secondly, we were also interested in examining whether neuropsychological risk factors differ across subtypes of male IPA perpetrators. Based on the established relationships between neuropsychological risk factors and IPA perpetration (see Head Injury, Executive Functioning, and Intelligence subheadings above), we hypothesized that men in the most severe perpetrator groups (borderline-dysphoric and generally violent-antisocial) would manifest the highest rates of head injury and lowest scores on measures of executive functioning and intelligence.

METHODS

Participants
The current study uses data that were originally gathered as part of the study published by Holtzworth-Munroe et al. (2000). The men participating in this study were, on average, in their thirties ($M = 35.6$ years), were majority Caucasian (75% Caucasian, 21% African American), and had completed an average of 2 years of college ($M = 14.1$ years of education). Most men (85%) were employed full time, and couples had an average combined household income of approximately $3,400 per month. Couples had been in their current relationship an average of 9.5 years and had an average of 1.1 children from the current relationship.

Procedure
Participants were recruited from a large Midwestern metropolitan area. Newspaper advertisements and flyers were placed around the city and sent to professionals working with potential study participants. Couples had to be married or living together and comfortable reading and writing in English. Couples who qualified for the study were invited to the laboratory for a series of three assessment sessions. Husbands and wives completed all measures in separate rooms, usually in different suites of rooms, to help protect the confidentiality and safety of wives in violent relationships. Couples completed the same measures at the same time to prevent them from discussing their responses. All neuropsychological assessment instruments were administered by trained study staff including doctoral- and master’s-level assessors. Participants were paid part of their compensation at the end of each session and, to encourage participation in the full study, received a bonus when they completed the study. In total, husbands received $165, and wives received $85.

Based on the couple’s responses, cluster analysis was utilized to assign the men to subtypes. Cluster analysis includes a variety of multivariate statistical procedures used to classify individuals into relatively homogeneous groups (see Aldenderfer & Blashfield, 1984). Four cluster analyses were conducted to determine the subgroups. The two main cluster analyses focused on the following measures: (a) the highest report of male-perpetrated aggression in the past year,
by either the men or women, on the Revised Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996); (b) the men’s self-reported use of violence against other individuals besides their female partner, on the Generality of Violence Questionnaire (Holtzworth-Munroe et al., 2000); and (c) the men’s scores on two scales derived by the authors from the Millon Clinical Multiaxial Inventory (MCMI-III, Millon, 1983)—a five-item scale measuring antisociality and a five-item scale measuring fear of borderline personality traits. Additional measures of sexually coercive behavior, maltreatment of women, borderline personality, psychopathy, and substance use were used to clarify subtype distinctions in subsequent cluster analyses. Please see Holtzworth-Munroe et al. (2000) for a detailed account of the subgroup procedures.

The cluster analyses resulted in the formation of the four subtypes (summarized above). Subgroup membership for each man was determined according to the cluster he was most frequently grouped with in each analysis. Thirty-seven men were grouped in the family-only subtype, 34 were categorized as low-level antisocial, and 31 men were placed in the borderline-dysphoric/generally violent-antisocial subtype.

Nonviolent comparison groups. These groups included men with no IPA in the past 5 years and no history of severe violence as indicated by both partners on the CTS2. Twenty-three men were classified as nonviolent and in distressed relationships. To be included in this group, both spouses had to score below 100 (scores indicating relationship distress) on the Short Marital Adjustment Test (SMAT; Locke & Wallace, 1959) or one spouse had to score below 80 (i.e., moderate-severe distress). Thirty-nine men were classified as nonviolent and nondistressed. Men were included in this group if neither partner indicated relationship distress (scores >100 on the SMAT).

Measures

The Head Injury Questionnaire, based on a measure developed by Rosenbaum and Hoge (1989), asks participants four questions (answered yes or no) about a history of head injury: history of a head injury resulting in a loss of consciousness or a concussion; history of medical treatment for a head injury; history of head injury diagnosis by a physician; and history of physical problems or symptoms following the head injury. A total score was computed by summing these dichotomous items. Cronbach’s alpha was .89. In the chi-square analyses presented in Table 5, this variable was examined dichotomously with a positive response on any one of the four items coded as “yes” for possible history of head injury. The WCST (Heaton, 1981) is a well-established measure of executive functioning and assesses skills such as planning and the capacity to establish and change cognitive set (a pattern of thinking about or a strategy of how to respond to a given problem). The test was administered and scored according to standardized methods (Heaton, 1981). The number of perseverative errors (errors made when the participant continues to respond in the same way, despite feedback from the examiner that the response is incorrect), total errors, number of trials to category, number of categories completed, and overall scaled score were used in the analyses.

The Trail Making Test Part B (Lezak et al., 2004) is used to assess mental flexibility, inhibitory control, visual attention, and motor sequencing. The TMT B is considered to be reliable and valid (Spreen & Strauss, 1998). Participants connect circles in an alternating fashion between numbers and letters. Errors committed during the test were immediately pointed out and corrected before participants were allowed to continue. The number of errors and the total time in seconds to complete part B were used in this study.

The Symbol Digit Modalities Test (SDMT; Smith, 1991) is a visual attention task that assesses executive functioning and overall functional integration through speed of information processing and working memory as well as scanning and visual tracking. The task requires participants to write as many numbers as possible beneath up to 110 symbols in 90 s. The SDMT closely resembles and is correlated with scores on the Digit Symbol subtest of the Weschler Adult Intelligence Scale (Morgan & Wheelock, 1995). The reliability of this test is adequate (Smith, 1991). In accordance with standardized procedures, scores were obtained by counting the number of correct responses.
The Shipley Institute of Living Scale (Shipley, 1946; Zachary, 1986) is an abbreviated intelligence test that compares favorably with other standardized intelligence tests, including the Weschler Adult Intelligence Scale (Zachary, 1986). Test–retest reliability is fairly high (Ruiz & Krauss, 1967). This measure consists of two discrete subtests: abstraction and verbal ability. The abstraction subtest contains 20 completion items for which participants provide appropriate responses based on item sequences or pairings. The verbal subtest has 40 multiple-choice items in which participants choose the synonym for words out of four possible choices. According to standardized procedures, subscale scores were computed as the number of correct responses on each half of the test.

Intimate partner aggression was measured with the 12-item Physical Assault (e.g., *I choked my partner*) and the eight-item Psychological Aggression (e.g., *I called my partner fat or ugly*) subscales of the Revised Conflict Tactics Scales (CTS2; Straus et al., 1996). Both male and female participants reported on the men’s aggressive behavior during the past year on a scale ranging from 0 (*never*) to 6 (*more than 20 times*). Items were recoded to reflect the estimated frequency of the behavior (e.g., *3–5 times* received a score of 4), and individual frequency scores were summed. The score of the partner who reported a greater frequency of IPA was used in all analyses. Pearson correlation statistics were computed to examine the concordance between male and female IPA reports. Based on Cohen’s (1988) suggestions for interpreting effect sizes, male and female reports of physical IPA (*r* = .74, *p* < .01) and reports of psychological IPA (*r* = .58, *p* < .01) were highly concordant. The 102 men in the IPA groups perpetrated an average of 12.3 (*SD* = 28.5; range = 1–190) acts of physical IPA during the previous year. Men in the non-IPA groups, by definition, did not perpetrate IPA during the previous year. The 102 men in the IPA groups perpetrated an average of 65.4 (*SD* = 41.32; range = 4–190) acts of psychological IPA during the previous year. The 62 men in the non-IPA groups perpetrated an average of 22.5 (*SD* = 21.9; range = 0–100) incidents of psychological aggression during the previous year.

**Analytic Procedure**

Data analysis was conducted using SPSS 14.0. Examination of variable distributions revealed that the Physical Assault subscale of the CTS2 was negatively skewed. To improve the normality of the distribution, a logarithmic transformation was performed, which significantly improved the skew of the distribution (Tabachnick & Fidell, 1996). Bivariate correlations were conducted to examine significant relationships between the predictor and outcome variables. A hierarchical multiple regression analysis was employed to test the relative predictive strength of the variables of interest. Income and years of education were entered on the first step of the regression, and neuropsychological measures that were significantly correlated at the bivariate level were added to the second step (WCST perseverative errors, WCST total errors, Shipley abstraction, Shipley verbal, head injury). Analysis of variance was used to examine mean subgroup differences on measures of executive functioning and intelligence. Chi-square analyses were used to assess group differences in rate of borderline impaired and impaired performance (scores below the 10th percentile). For the purposes of the subgroup comparison, the two most severe groups of IPA perpetrators (borderline-dysphoric and generally violent-antisocial) were combined. This decision was based on the fact that the two subtypes are conceptually similar on the variables most relevant for this study. Both subtypes exhibit moderate to severe IPA perpetration and elevated levels of both general aggression and psychopathology. (The nature of the psychopathology is one of the central differences between them; however, this distinction is not directly relevant for the current study.) Additionally, combining these groups allows us to compare across subtypes of relatively equivalent size. Preliminary analyses indicated no between-group differences when the borderline-dysphoric and generally violent-antisocial groups were compared on all predictor variables of interest.

**RESULTS**

Prior research with this sample revealed that the subgroups differed on two demographic variables (Holtzworth-Munroe et al., 2000). Specifically, borderline-dysphoric men had less
education than the family-only men and both groups of nonaggressive men, and significantly lower income than nonviolent/nondistressed men. Holtzworth-Munroe et al. (2000) argue that such disparities reflect naturally occurring differences between groups (e.g., research has consistently demonstrated that severe IPA is associated with lower socioeconomic status) and thus should not be statistically controlled. However, to be conservative, we entered education and income (known to be related to violence) in analyses predicting IPA from our main measures of interest.

The correlation matrix for the predictor variables (head injury, executive functioning, and intelligence) is presented in Table 1. Small to moderate correlations exist among all of the executive functioning and intelligence measures, including the WCST, the TMT B, and the SDMT (Cohen, 1988). Age, income, and education were correlated with performance on many neuropsychological measures. Surprisingly, head injury was not associated with either the neuropsychological or demographic measures. Table 2 depicts the correlations between scores on the predictor variables and IPA. In the bivariate analyses, IPA was separated into physical and psychological IPA in order to examine differences between types of aggressive behavior. Perseverative errors on the WCST, total errors on the WCST, low scores on the Shipley verbal and abstraction subscales, and head injury were all significantly related to physical IPA in the past year. Verbal intelligence was the only neuropsychological variable significantly related to psychological IPA.

We used multiple regression to examine the unique associations between the significant bivariate correlates and IPA. Income and years of education were statistically controlled for because these background variables are both closely tied to neuropsychological variables and have been associated with expression of aggressive behavior (Holtzworth-Munroe et al., 1997). Age was not related at the bivariate level and so was not included in the regression analysis. Verbal intelligence was the only significant predictor of psychological IPA; thus, a regression was not conducted for this outcome. The results of the regression examining physical IPA perpetration are presented in Table 3. Years of education, history of head injury, and scores on the Shipley verbal intelligence subscale emerged as significant predictors of physical IPA. The neuropsychological variables accounted for 15% of the variance in IPA beyond the effects of the demographic variables alone. It is notable that when the neuropsychological factors were added to the regression equation, years of education was no longer a significant predictor of physical IPA.

Table 4 shows a comparison of mean performance on each of the neuropsychological measures across the subgroups of aggressive and nonaggressive men. Overall, $F$ values for one-way analyses of variance tests (ANOVs) were significant for WCST perseverative errors, WCST total errors, Shipley abstraction, and the Shipley verbal. Mean comparisons were made using the Tukey honestly significant difference (HSD) procedure for differences between means.

Table 5 shows the frequency of individuals scoring in the borderline impaired and impaired ranges (i.e., below the 10th percentile) according to subgroup. On the WCST and the Shipley Abstraction Test, men in the most severe IPA group (borderline-dysphoric/generally violent-antisocial group) had the highest frequency of impaired performance. Sixty-three percent of men in the severe IPA subtypes indicated possible history of head injury.

**DISCUSSION**

The purpose of this study was to examine possible neuropsychological correlates (i.e., head injury, executive functioning, and intelligence) for IPA frequency among male perpetrators of IPA and to explore differences in neuropsychological functioning among previously established subtypes of IPA perpetrators. We hypothesized that a history of head injury and lower mean scores on measures of executive function and intelligence would be associated with greater frequency of physical and psychological IPA. We also hypothesized that the most severe perpetrators (borderline-dysphoric/generally violent-antisocial) would manifest the highest rates of head injury and lowest mean scores on measures of executive functioning and intelligence. Both hypotheses were partially supported. Verbal intelligence and self-reported history of head injury predicted the frequency of physical IPA perpetration in the whole sample. Verbal intelligence
Table 1
Bivariate Correlations Between Neuropsychological and Head Injury Measures

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<tr>
<th>WCST p</th>
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<th>WCST cat</th>
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<th>TMT B</th>
<th>TMT B err</th>
<th>SDMT</th>
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Note. WCST p = Wisconsin Card Sorting Test, perseverative errors; WCST err = total errors; WCST cat = number of trials to category; WCST tot = total number of categories completed; TMT B = Trail Making Test Part B, seconds to complete; TMT B err = total number of errors; SDMT = Symbol Digit Modalities Test, number correct; Ship A = Shipley Institute of Living Scale, Abstraction subscale; Ship V = Verbal subscale. *p < .05; **p < .01.
was also significantly related to psychological IPA. The subtype comparisons indicated that mean scores on the verbal intelligence measure differed according to subtype, with the severe IPA subtypes exhibiting the lowest scores. This study adds to the body of research on this topic by examining a relatively large, community-based sample, examining physical as well as psychological IPA, and comparing correlates across subtypes of IPA perpetrators and nonaggressive men.
The first hypothesis that a history of head injury, lower mean scores on measures of executive function, and lower mean scores on measures of general and verbal intelligence would be associated with greater frequency of physical and psychological IPA perpetration was partially supported. At the bivariate level, a history of head injury, errors on the WCST, and lower mean score on a measure of verbal intelligence were correlated with the frequency of physical IPA perpetration, and lower mean score on verbal intelligence was correlated with psychological IPA. In the regression analysis, self-report of head injury and performance on a measure of verbal intelligence were significant predictors of physical IPA and superior to demographic predictors.

Several studies indicate that performance on TMT B is related to IPA perpetration (Schafer & Fals-Stewart, 1997; Stanford et al., 2007; Teichner et al., 2001; Westby & Ferraro, 1999), so the lack of relationship in our study is somewhat surprising. TMT B assesses cognitive flexibility and set shifting. Prior research has examined participants court-ordered to IPA treatment (Stanford et al., 2007; Teichner et al., 2001; Westby & Ferraro, 1999) or in recovery from substance abuse (Schafer & Fals-Stewart, 1997), whereas our sample is a community sample composed of nonperpetrators, mild perpetrators, and severe perpetrators. It is difficult to compare across samples given that those court-mandated to IPA treatment or substance abuse treatment may differ significantly from community participants on a number of indicators.

Prior research has yielded inconsistencies when using the WCST. Failure to maintain set has been linked to IPA perpetration (Stanford et al., 2007); however, other studies have not detected differences between IPA perpetrators and control groups using the WCST (Westby & Ferraro, 1999). Perseverative errors on the WCST are an indication of the ability to integrate verbal feedback, inhibit responses, and make self-corrections. The relationship between IPA perpetration and impulsivity has already been established in this sample (Holtzworth-Munroe et al., 2000), and this may underlie the finding that perseverative errors are related to physical IPA perpetration given that this component of the WCST requires response inhibition. Difficulty on this aspect of the WCST may also be related to verbal intelligence given the reliance

| Table 4
| Group Differences in Mean Scores on Neuropsychological Measures |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                | Nondistressed (n = 39) | Distressed only (n = 18) | Family antisocial (BD/AS) (n = 36) | Low-level antisocial (BD/AS) (n = 33) | Severe IPA (BD/AS) (n = 30) | F value |
| WCST p                          | 7.28a           | 5.17a           | 9.39a,b         | 9.06a,b         | 17.47b          | *(4, 151) = 4.11** |
| WCST err                        | 21.77a         | 20.33a         | 31.44a,b        | 27.94a,b        | 38.47b          | *(4, 151) = 2.65* |
| WCST cat                        | 14.49          | 15.17          | 12.67           | 11.21           | 13.77           | *(4, 151) = 1.21 |
| WCST tot                        | 5.49           | 5.39           | 4.75            | 5.15            | 4.37            | *(4, 151) = 2.11 |
| TMT B                           | 66.45          | 69.31          | 68.27           | 67.49           | 77.33           | *(4, 151) = 0.63 |
| TMT err                         | .38            | .58            | .56             | .47             | .43             | *(4, 151) = 0.33 |
| SDMT                            | 55.31          | 53.74          | 53.42           | 51.52           | 50.73           | *(4, 152) = 0.73 |
| Ship A                          | 16.00a         | 14.26a,b       | 14.94a          | 14.94a          | 11.83b          | *(4, 152) = 4.90** |
| Ship V                          | 31.85a         | 31.05a         | 30.64a          | 31.00a          | 25.20b          | *(4, 152) = 7.01*** |

Note. Means in the same row that do not share subscripts differ at p < .05 in the Tukey honestly significant difference comparison. BD/AS = borderline-dysphoric/generally violent-antisocial, WCST p = Wisconsin Card Sorting Test, perseverative errors; WCST err = total errors; WCST cat = number of trials to category; WCST tot = total number of categories completed; TMT B = Trail Making Test Part B, seconds to complete; TMT B tot = total number of errors; SDMT = Symbol Digit Modalities Test, number correct; Ship A = Shipley Institute of Living Scale, Abstraction subscale; Ship V = Verbal subscale. *p < .05; **p < .01; ***p < .001.
<table>
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<tr>
<th></th>
<th>Nonaggressive subtypes</th>
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<td></td>
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<td>Family only</td>
<td>Low-level</td>
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<td></td>
<td>(N = 156)</td>
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<td>(n = 18) (%)</td>
<td>(n = 36) (%)</td>
<td>antisocial (n = 33) (%)</td>
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<td>1 (3)</td>
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<tr>
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<td>2 (5)</td>
<td>4 (11)</td>
<td>5 (15)</td>
<td>4 (13)</td>
</tr>
<tr>
<td>Ship A</td>
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<td>2 (3)</td>
<td>3 (8)</td>
<td>2 (6)</td>
<td>10 (33)</td>
</tr>
<tr>
<td>Ship V</td>
<td>16</td>
<td>2 (5)</td>
<td>4 (11)</td>
<td>2 (6)</td>
<td>7 (23)</td>
</tr>
<tr>
<td>Head I</td>
<td>59</td>
<td>9 (26)</td>
<td>9 (24)</td>
<td>14 (42)</td>
<td>19 (63)</td>
</tr>
</tbody>
</table>

Note. Borderline and impaired functioning was defined as performance below the 10th percentile or a z-score < -1.28. Based on the normed means for each test. This cutoff is consistent with the guidelines presented in Lezak et al. (2004). BD/AS = borderline-dysphoric/generally violent-antisocial. WCST = Wisconsin Card Sorting Test total score; TMT B = Trail Making Test Part B total score; SDMT = Symbol Digit Modalities Test, number correct; Ship A = Shipley Institute of Living Scale, Abstraction subscale; Ship V = Verbal subscale; Head I = Head Injury Questionnaire. *p < .05; **p < .01.
on verbal feedback to modulate one’s own behavior. Aggressive men, as a group, do not suffer from executive function impairment but exhibit lower average performance specifically in verbal proficiency, self-correction, and response inhibition. Other executive functions such as cognitive flexibility and set shifting (as assessed by TMT B) may not be as related to IPA. In general, the severity of neuropsychological deficits among IPA perpetrators appears to be relatively mild and not evident in all perpetrators (Cohen et al., 2003). Perhaps most surprising is the lack of relationship between head injury, executive functioning, and perpetration of psychological aggression. Verbal intelligence was the only predictor significantly correlated with this outcome. Low verbal intelligence, specifically deficits in comprehension and the ability to effectively use language to express and solve problems, is particularly implicated in psychological aggression (Cohen et al., 2003). The lack of relationship between psychological aggression and head injury is a departure from prior research (Warnken et al., 1994), as is the lack of relationship between executive function and verbal aggression (Chambers et al., 2006). It is possible that the head injury measure used in this study may not have been sensitive enough to detect these relationships (more on this below). This continues to be an area for future research given the variation in findings, the limited body of research examining neuropsychological factors and psychological aggression, and the deleterious effects of psychological aggression (Taft et al., 2006). One possible reason for the limited findings related to head injury is that the self-report measure for head injury used in this study may not be sensitive enough to detect these relationships. Self-report measures may be subject to reporting bias, and this measure does not include collateral reports of health care providers or medical records. In addition, participants who have a history of head injury may not be reliable reporters. Although it has practical utility (Rosenbaum & Hoge, 1989), the four-item measure may not be sufficient to capture the range of injuries and associated symptoms that participants may have experienced. In addition, the Head Injury Questionnaire does not directly assess impairment that is not injury related (i.e., damage caused by infectious disease, genetic abnormalities, or exposure to toxins or other factors). Previous research also suggests that self-reports of head injury do not consistently map onto other neuropsychological factors (Cohen et al., 2003; Raine, Stoddard, Bihrlle, & Buchsbaum, 1998), meaning that performance on specific neuropsychological assessment tools can be impaired without the presence of self-reported head injury and head injury can occur without impairment on individual neuropsychological measures. The mechanism by which head injury influences IPA is still unclear; therefore, it is important that a history of head injury continues to be examined in addition to performance on neuropsychological assessment instruments. Advances in assessment of head injury and the use of brain imaging technologies such as functional magnetic resonance imaging may serve to clarify these relationships in future research.

The second hypothesis predicting subgroup differences in performance on neuropsychological measures was also partially supported. The most severely aggressive groups had lower mean scores on the verbal intelligence measure, and the analyses indicated trends toward more errors on the WCST, lower scores on measures of abstract intelligence, and higher rates of head injury. No differences were observed on the other WCST subscales or the other two executive function measures (i.e., TMT B and SDMT). The most severe subtype (borderline-dysphoric/generally violent-antisocial) had significantly higher rates of borderline impaired/impaired performance on the WCST and Shipley Abstraction, as well as higher rates of reported head injury. The subtype analysis confirms the salience of intelligence in IPA perpetration, particularly among severe, highly pathological perpetrators. The lack of subtype differences across neuropsychological domains indicates that neuropsychological risk factors may not be a central factor in distinct patterns of IPA perpetration. However, more research is needed to determine whether differences emerge in other samples utilizing more comprehensive neuropsychological assessment.

Given the apparent role of verbal intelligence in both psychological and physical IPA, especially among the most severe perpetrator subtypes, it is important that IPA prevention and intervention programs emphasize the acquisition of verbal skills without relying heavily on existing verbal abilities. As highlighted by Cohen et al. (2003), limited verbal ability may adversely impact an individual’s capacity to accurately comprehend, interpret, and respond in emotionally charged situations. In addition to utilizing techniques to improve verbal capacity,
kinesthetic learning and an emphasis on the development and practice of concrete skills may prove to be more effective for participants with limited verbal ability. The development of treatment programs tailored to those with limited verbal capacity is an area that warrants additional research.

The current findings serve to inform targeted prevention efforts by early identification of men who may be at increased risk to engage in IPA. Men undergoing treatment or evaluation for a head injury may benefit from IPA risk assessment and from participation in skill-building programs to increase capacity to manage intimate partner conflict without aggression.

Next steps in this research area are to explore the implications of these findings for prevention and intervention. Assessing treatment outcomes for those with a history of head injury or mild impairments in executive functioning and verbal intelligence could inform the improvement in programs to better address the needs of relationships at risk of or already suffering the consequences of IPA. The current study is the first attempt to examine neuropsychological correlates of psychological IPA distinct from physical IPA. Further exploration of this topic may yield a better understanding of potential neuropsychological risk factors for psychological IPA. Our findings indicate that those in the nonaggressive distressed control group had relatively elevated rates of head injury and lower mean performance on the abstraction subscale. This control group did not differ from the two most severely aggressive groups on two of the three measures. An important area of future research is continued exploration of the role that neuropsychological risk factors may play in relationship distress more generally. As noted earlier, advances in imaging technologies present new opportunities to address these questions.

As noted in Holtzworth-Munroe et al. (2000), the sample used in this study has several limitations. Given that the sample was not randomly selected or a representative community sample, it is not possible to report the prevalence of a given perpetrator subtype in the general population. Future research is needed to assess whether these findings are consistent across racial and ethnic groups. Although the sample size is adequate for research in this area, some of the comparison groups were relatively small. Future projects would benefit from the use of larger sample sizes and more extensive assessment batteries, which may improve the strength of the findings related to the role of executive functioning in IPA perpetration.

Taken as a whole, these findings lend support to the idea that neuropsychological functioning is a factor in the etiology of IPA in a subset of abusers. However, it is important to note that biology never acts in isolation. IPA is not a behavior that is narrowly determined; rather, it is likely the result of interrelationships between physical and social environment, neuropsychological and biological factors, and individual differences.

REFERENCES


