



TESTING THE UTILITY OF NEURAL NETWORK MODELS TO PREDICT  
HISTORY OF ARREST IN BATTERERS

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A Dissertation Presented to  
The Faculty of the Department  
of Psychology  
University of Houston

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In Partial Fulfillment  
Of the Requirements for the Degree of  
Doctor of Philosophy

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By  
Jason W. Cooper  
August, 2012

# TESTING THE UTILITY OF NEURAL NETWORK MODELS TO PREDICT HISTORY OF ARREST IN BATTERERS

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## **ABSTRACT**

In prisons, risk assessments are typically based on retrospective reports of factors known to be correlated with violence recidivism. Previous studies have used linear models that rely on variables that have been linked to past history of intimate partner violence (IPV) based on men's report only. The current study compares the non-linear neural network model to traditional linear models in predicting a history of arrest for any crime in men who self-report a history of IPV. In addition, models that include men's report only were compared to models that also include the victim's report. The neural network models were found to be superior to the linear models in their predictive power. Models that included victim report were superior to models that did not include victim report. These findings suggest that the prediction of violence recidivism may be enhanced through the use of neural network models and through models that include information gathered from victims.

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## Introduction

Psychologists and legal experts regularly make use of tools designed to predict criminal recidivism. Although these tools have made significant improvements in recent decades there is general agreement that experts are poor at predicting which inmates will recidivate and which will not. Gottfredson and Snyder (2002) argue that although risk scales are commonly used to predict recidivism, they are limited in their ability to accurately predict future behavior and additional research is necessary to increase their accuracy. The goal of this study is to enhance current methods for predicting recidivism in men who commit intimate partner violence (IPV).

One reason that current methods for predicting recidivism perform poorly is that they treat all inmates as a homogenous group. However, research suggests that criminals vary across many important variables including the motivation for their criminal behavior and the likelihood of rehabilitation (Fagan, & Ax, 2003). Early research suggests that measures focusing on specific criminogenic theories may possess greater predictive power than models lacking in specificity (Campbell, French & Gendreau, 2009). Therefore, tools are needed that are designed to predict a specific type of violence recidivism in specific subpopulations of criminals, such as those arrested for IPV.

Secondly, researchers generally use linear models such as logistic regression to predict recidivism. However, linear models are limited in their ability to predict complex phenomena such as recidivism (Caulkins, Cohen, Gorr & Wei, 1996). For example, linear models assume that the independent variables are normally distributed and are not correlated although most psychosocial measures are correlated. Neural networks are non-linear models that do not have some of the limiting properties of linear models. For

example, they do not require that independent variables be uncorrelated, or normally distributed (Principe, Euliano, & Lefebvre, 2000). Thus, neural networks may have a greater ability than linear models to predict which men are likely to commit IPV in the future and which are not.

Third, models of recidivism have not typically taken both perpetrator and victim report into account. Although IPV has been shown to be better predicted by perpetrator characteristics than victim's characteristics, the addition of the victim's report of the perpetrators characteristics and history may enhance the models predictive power over models that rely on the report of only the victim or only the perpetrator.

### **RISK ASSESSMENT FOR INTIMATE PARTNTER VIOLENCE**

IPV has been identified as one of the world's most complex and intractable public health concerns (Dunford, 2000). Nearly one in ten adults report being victims of IPV within the past year (Straus & Gelles, 1990a; Straus & Gelles, 1990b), and estimates of the percentage of couples seeking therapy who report a history of physical aggression range from 35-60% (O'Leary, Vivian, & Malone, 1992). Clinic samples report higher prevalence rates of violence than non-clinic samples with women being victimized in about 50% of couples seeking therapy (Jose & O'Leary, 2009). Although the vast majority of physical aggression does not cause injury (Johnson, 1995), serious injury and death do occur as a result of IPV. Stets and Straus (1990) found that 3.0% of female victims and 0.4% of male victims required medical attention after an incident of IPV occurred. Similarly, Archer (2006) found that 62% of the injuries due to violence were reported by females. In 2000, an estimated 1,247 women were murdered during an IPV

event, and of all murder victims, 33% of females and 4% of male victims, were killed by their partners (Rennison, 2003).

Among prison inmates, the statistics are even more disconcerting. Nearly one quarter (22%) of prison inmates have been convicted of family violence (Durose et al., 2005). About 90% of offenders in state prisons for family violence had at a minimum caused physical injury to their victim and a staggering 28% of those offenders had murdered their partner (Durose et al., 2005). Although recidivism rates are high for a wide variety of crimes, they are particularly high in cases of IPV. Gondolf (2000) examined data obtained via interview with the former and current partners of male batterers referred to batterer programs by the court. His results illustrate the high rates of recidivism among perpetrators of IPV. For example, 41% of those interviewed reported that men committed a re-assault during the 30-month follow-up period and roughly 20% of the men involved in the study repeatedly re-assaulted. Repeat offenders were responsible for the majority of the physical injuries to their partners (Gondolf, 2000). Given the risk of serious injury and death that partners of violent men and women face, it is particularly important that we are able to distinguish those individuals who are repeat offenders of IPV.

### HISTORY OF IPV RISK ASSESSMENT

The first models designed to predict recidivism employed a simple dichotomized system in which an inmate received a 1 if he possessed a particular quality associated with recidivism and a 0 if he did not. The sum of his score was used to judge his likelihood of re-offending if he were to be placed on parole (Burgess, 1928). As the field of statistics evolved, so did the methodology for predicting recidivism. In the 1950's multiple regression was used to predict recidivism rates. Other models developed during

the 1960's included predictive attribute analysis (Glaser, 1962), and the use of contingency tables (Van Alstyne and Gottfredson, 1978). Unfortunately, these models performed poorly. Due to the lack of adequate methods for predicting recidivism, there has long been a belief that human behavior (especially criminal behavior) is so complex that it can never be reliably predicted (Monahan, et al., 1978). This belief was also influential in the legal realm as can be seen in *Barefoot v. Estelle*, 463 U.S. 880. During this court battle over a capital murder case in Texas, the American Psychiatric Association filed a brief stating that predictions about future violence were incorrect two out of three times.

However, beginning in the 1970's a slowly growing number of mental-health, and legal experts became increasingly optimistic that under particular conditions it was possible to make reasonably accurate predictions about which inmates were likely to recidivate and which were not (e.g. Monahan, 1984). More recently, both psychologists and legal experts are growing more confident in their ability to accurately predict recidivism. Doren (2002) describes how laws such as the Wisconsin Sexually Violent Persons Act of 1994 are predicated on the assumption that criminal behavior is predictable based on an individual's previous criminal behavior. A growing body of research is supporting this assumption. A line of research by Hagan (e.g. Hagan and King 1997) has found that experienced and well trained psychologists were able to predict which inmates would recidivate and which would not at a rate greater than random chance.

Although the field has made important advances in the past 40 years, Caulkins, Cohen, Gorr & Wei (1996) point out that the current linear methods of predicting

recidivism have false positive and false negative rates that exceed 50% and they argue that new methods of predicting recidivism are not likely to improve the accuracy of the predictions and call for advances in the underlying theory behind predictive models.

One possible reason for our poor performance in predicting recidivism is the lack of empirically based means of assessing inmates. As Healey, Smith and O'Sullivan (1998) stated "Few jurisdictions have systematic assessment tools based upon an articulated theory of batterer typology." This is certainly not due to a lack of research on IPV. Given the previously discussed research on IPV, it is clear that the next step is to take that knowledge and apply it to the development of a prediction model specific to perpetrators of IPV.

### IPV RISK ASSESSMENT TOOLS

With the recent advances in our understanding of IPV and its related factors, there has been a proliferation of measures designed to assess for the likelihood and severity of future incidents of IPV. These measures run the gamut in terms of their method of assessment (self-report questionnaires, interviews etc.), their length, and the specific risk factors examined.

The present study utilizes two of the more commonly used measures of IPV risk factors; the Personal and Relationships Profile (PRP; Straus et al., 1999) and the Dyadic Adjustment Scale (DA; Campbel, 1986, 2005). Male perpetrators of IPV were administered the PRP and assessed on 22 variables related to IPV. The following is a brief description of each PRP subscale the empirical support that links that subscale to IPV risk.

*Anger Management*—There is a growing consensus that many batterers have difficulty managing feelings of anger and hostility. Recent reviews and meta-analyses have shown that among male perpetrators of IPV there is an association between anger and physical aggression towards their intimate partner (Eckhardt, Norlander, & Deffenbacher, 2004; Holtzworth-Munroe & Clements, 2007; Stith, Smith, Penn, Ward, & Tritt, 2004). Perpetrators of IPV have also been found to be more hostile than non-violent men, with hostility rates comparable to generally violent offenders (Barnett, Fagan, & Booker, 1991), IPV men also score higher on measures of both state and trait anger than non-violent men (Barbour, Eckhardt, Davison & Kasson, 1998).

However, some researchers have suggested that the relationship between anger and violence is not as straightforward. For example, Hastings and Hamberger (1988) found lower levels of anger in perpetrators of IPV relative to non-violent men. Based on these and similar results, Murphy and Eckhardt (2005) argue that we cannot make broad generalizations regarding the relationship between anger and violence. Other studies have found more nuanced results suggesting that men with particular psychological disorders such as borderline personality disorder or antisocial personality disorder have the highest levels of under-controlled anger. Understanding these more precise types of anger and their role in IPV may be critical in developing an effective tool for predicting future IPV. The ability of neural networks to identify the complex relationships between perpetrators of IPV and emotion regulation may aid research in this area.

*Antisocial Personality* – The Antisocial Personality Scale consists of personality features derived from the DSM-IV (American Psychiatric Association, 1994). These personality features include irresponsibility, general hostility, poor social relationships

and impulsivity. Males that demonstrate aggressive tendencies have been found to exhibit higher levels of antisocial personality traits than non-aggressive males (Murphy, Meyer, & O'Leary, 1993). Community and correctional interventions are based on the notion that dysregulated emotions are directly related to the aggressive behaviors (Rosenbaum & Leisring, 2001). A review of the literature by Knight, Guay and Patrick (2006) suggests that antisocial attitudes and beliefs have been associated with more frequent and severe forms of IPV, including sexual aggression.

Numerous longitudinal studies strongly suggest that a developmental history of antisocial behavior is one of the more robust predictors of IPV (e.g. Andrews, Foster, Capaldi & Hops, 2000; Ehrensaft et al., 2004). The risk of domestic violence in antisocial men may be even higher than previously thought given recent research suggesting that antisocial men tend to selectively partner with women who also exhibit antisocial traits. When such pairing occurs, both partners are likely to have histories of violence, poor social skills and problem solving skills, high stress reactivity, and poor emotion regulation (Kim & Capaldi, 2004; Moffitt et al., 2001). Not only does research suggest that antisocial traits are associated with IPV, high levels of antisocial traits are associated with poorer treatment response in offenders (Langton, Barbaree, Harkins, & Peacock, 2006). Additionally, some forms of therapy may actually increase violent recidivism in perpetrators that possess antisocial traits (Rice, Harris & Cormier, 1992). This is important information for judges and parole boards to be aware of as they determine the risk of a particular perpetrator of IPV.

*Borderline Personality* – IPV men's borderline personality features have been found to correlate with their emotional and physical abuse and account for a large

proportion of the variance in emotional abuse perpetration (Dutton & Starzomski, 1993).

Moreover, one type of batterer, the Dysphoric/Borderline type tends to engage in both sexual and psychological abuse at moderate to severe levels (Holtzworth-Munroe and Stuart 1994). These batterers typically restrict their abuse to family members. However, some may also exhibit extra familial violence and other forms of criminal behavior.

Batterers with borderline personality traits were more likely than batterers without borderline personality traits to be emotionally volatile batterers, have the highest levels of jealousy and provide particularly low scores on marital satisfaction (Saunders, 1992).

*Conflict Scale* – The Conflict Scale is used to measure areas of disagreement between partners. Couples with a history of IPV have been found to experience higher levels of marital conflict than non-violent couples. Couples' conflict predicts the occurrence of men's and women's perpetration of IPV, as well as the frequency of women's IPV perpetration (Johnson, 1995). Thus, the frequency and severity of IPV tend to increase as the amount of ongoing, unresolved conflict between the partners increases. Straus, Gelles, and Steinmetz (2006) have argued that enduring vulnerabilities such as those measured by other PRP scales may play a role in IPV via their role in maintaining or exacerbating conflict between the partners.

*Communication Problems*– The Communication Problems Scale measures the degree to which partners have difficulty verbally expressing themselves to their partner. Babcock, Waltz, Jacobson, and Gottman (1993) compared partners with a history of IPV to couples that were distressed but not engaged in IPV and couples that were happy. Their research suggests that violent couples tend to engage “husband demand /wife withdraw” interaction style. This communication style may be indicative of a perceived

lack of power on the part of the male which results in violent behavior designed to make up for the husband's lack of power in other areas.

*Criminal History* – Men that have committed non-violent crimes are at a higher risk of committing IPV than those who have no criminal history. Similarly, men with a history of IPV are at increased risk of committing more frequent and severe acts of violence against their partner as they become involved in the legal system (Buzawa, Hotaling, Klein, and Byrne, 1999). Buzawa and colleagues have argued that when a perpetrator of IPV is charged with a crime, his levels of distress and marital conflict increase significantly, thereby increasing the risk of violence towards his partner. Straus and Ramirez (2004) suggest that partner assaults are part of a more general pattern of criminal behavior or a specialized type of crime. A history of prior criminal acts is associated with an increased probability of assaulting a partner, particularly when those prior criminal acts include violence, or when the onset of criminal behavior occurred at a young age.

*Depressive Symptoms* – The Depressive Symptoms scale measures levels of disturbances in mood, dysphoric cognitions, and somatic disturbances. It has long been suspected that mood disturbances play a role in IPV, and research has supported the idea that depression is a significant predictor of male violence against female partners (Julian & McHenry, 1993). MMPI-2 profiles of IPV men suggest that along with psychopathic personality traits, male batterers also tend to exhibit high levels of depressive personality traits (Flournoy & Wilson, 1991). Flournoy and Wilson suggest that perpetrators of IPV may have a strong tendency towards situational depression, feel inadequate and dissatisfied with themselves, and be overly dependent on their partners.

Depressive traits may make them more likely to use violence in order to feel more powerful in their relationship and to prevent their partner from leaving. The PRP Depressive Symptoms scale was found to correlate moderately with the Beck Depression Inventory (Beck, Steer, and Brown 1996),  $r = .43$ .

*Dominance* - The dominance scale examines the degree to which the person with more power in the relationship uses that power to gain status, power or control over their partner. Both men and women in physically aggressive relationships use aggression to instrumentally control their partners and both genders may perceive their partner as being controlling (Babcock, Miller & Siard, 2003). Studies examining multiple variables related to IPV suggest that factors related to power and control are important correlates and sometimes precursors to IPV (O'Leary, Smith Slep, & O'Leary, 2007). In fact, particular forms of control are correlated with IPV: male dominance in family decision making, male in control of the family's money, and societal restrictions on female initiated divorce (Levinson, 1989).

*Gender Hostility* – The Gender Hostility scale of the PRP examines the degree to which a perpetrator of IPV has negative beliefs or emotions about the opposite sex. Nonviolent men are less likely to be from families in which they were exposed to violence, more likely to have egalitarian expectations from marriage, and more likely to be characterized as androgynous (Haj-Yahia & Edleson, 1994). On the other hand, men with a history of being physically and verbally aggressive toward their partners were more likely to have come from homes where they were exposed to violence, were less likely to empathize with their fiancées, and more likely to hold negative and traditional attitudes toward women (Haj-Yahia & Edleson, 1994).

Delineations among types of abuse revealed that men who are emotionally abusive, score higher on hostility and on attitudes condoning aggression as compared with non-emotionally abusive men (Margolin, John, and Foo 1998). Gender hostility has also been linked to other factors related to IPV. For example, the relationship between alcohol use and marital aggression was especially high in men that reported low levels of marital satisfaction or high levels of gender hostility (Leonard & Blane, 1992).

*Jealousy* – The Jealousy Scale measures concern about the sexual and social exclusiveness of their current partner. For men and women, the jealous individual's anger and blame tend to focus more on the partner than the rival. However, males are more likely than females to consider aggressive actions against the rival male rather than their female partner (Luci, Foss, & Galloway, 1993). Not surprisingly, a strong correlation was found between anger and blame. Many criminal cases involve a jealous male reacting violently towards his partner when he suspects that she may be emotionally or sexually involved with a rival male (Luci, Foss, & Galloway, 1993).

*Negative Attributions* – The Negative Attributions Scale measures the degree to which one spouse blames their partner or attributes negative intentions to their partner. Individuals that tend to be interpersonally aggressive have been found to make significantly more negative attributions regarding their partner's aversive behavior (Moore, Stewart, Eisle, & Franchina, 2003). Men with a history of aggressive behavior in their relationship show greater negative attributions regarding the women's behavior in hypothetical vignettes (Moore, Stewart, Eisle, & Franchina, 2003).

*Neglect History* – The Neglect History Scale measures unfulfilled physical and emotional needs from an individual's family of origin. Students who were victims of

neglect as children were more likely than other students to have physically assaulted a dating partner (Straus, 2006). Multilevel modeling also found that the more severe the neglect a child experiences, the more likely that child is to commit IPV as an adult (Straus & Savage, 2005).

*Post-Traumatic Stress* – The Post-Traumatic Stress Scale of the PRP examines the amount of experiencing and re-experiencing of traumatic events as well as the degree to which an individual avoids or experiences physiological arousal as a result of a trauma. Trauma, and war related trauma in particular, appear to be associated with increased violence in one's domestic relationships (Maguen et al., 2010; Taft, Pless, Stalans, Koenen, King, & King, 2005). For example, soldiers who killed enemy combatants were more likely than those who witnessed killings to be later perpetrators of IPV (Van Winkle and Safer, 2011).

*Relationship Commitment* – The Relationship Commitment Scale measures the degree to which the respondent wishes and plans to work for the continuance of the relationship. Researchers have made many attempts to understand why partners remain in abusive relationships and the level of commitment that one has to the relationship has proven to be an important factor (Bauserman & Arias, 1992). Commitment was highly predictive of stay/leave behaviors, and significantly distinguished women who returned to their partners immediately after leaving the shelter from women who did not (Rusbult & Martz, 1995).

*Relationship Distress* – The Relationship Distress Scale examines areas of dissatisfaction within the relationship. Violent relationships are often marked by high conflict and few positive interactions (Straus, 2007). It is not surprising that couples in

distressed marriages are more likely than couples in non-distressed marriages to exhibit various forms of aggression and that distress and violence are highly correlated (Stith, Smith, Penn, Ward & Tritt, 2004). There appears to be a bi-directional relationship of marital discord with IPV, such that IPV is both an outcome and a risk factor for future relationship dissatisfaction and instability (Lawrence & Bradbury, 2007).

*Social Integration* – This scale examines the degree to which an individual conforms to society and social norms. Items on this scale are designed to assess the individual's social networks, membership in organizations and other aspects of their social life. Lackey and Williams (1995) found that men with strong social bonds and that are members of positive organizations are much less likely to commit IPV. Thus, social integration appears to be a strong protective factor.

*Stressful Conditions* – The Stressful Conditions Scale assesses the amount of stressors or daily hassles that one is experiencing. These stressors include interpersonal problems, external stressors and problems related to self-fulfillment (Margolin, John, & Foo 1998). Couples are more likely to have experienced both verbal and physical aggression if they had experienced stressors such as being younger at union inception, having been together for less time, were both in their first union, had only one partner who was employed, had a nontraditional woman paired with a traditional man, had at least one partner who abused substances, had more children, had more frequent disagreements, exhibited a more hostile disagreement style, or lived in an economically disadvantaged neighborhood (Demaris et al., 2003).

*Substance Abuse* – A large and growing body of research implicates drug and alcohol abuse as a major correlate of IPV (Foran & O'Leary, 2009; Stuart et al, 2006).

Substance abuse is a significant predictor of IPV and the effect size is particularly strong among male IPV offenders who use illegal substances (Stith, Smith, Penn, Ward & Tritt, 2004). In addition to being linked to IPV, substance abuse has been linked with marital rape (Finkelhor & Yllo, 1985). Alcohol abuse in particular appears to play a key role in IPV. Approximately 60% of men who batter their partners abuse alcohol (Conner & Ackerly, 1991). Fals-Stewart (2003) reported that on days when abusive men were drinking, the odds of them perpetrating IPV were eight times higher than on days they didn't drink. The odds of severe IPV on drinking days were 11 times higher than on days of no drinking, strongly suggesting that among abusive men, during times of intoxication there is a sharp increase in the risk of a violent event.

*Sexual Abuse History*— The Sexual Abuse History Scale contains items related to sexual abuse the participant may have suffered before the age of 18. These items specifically address whether the perpetrator of the abuse was an adult or child, and a family member or non-family member. A great deal of research has suggested that when children are sexually abused, they are at significant risk for a variety of problems as adults. For example, Widom & Maxfield (2001) compared arrest records for adults with a history of child sexual abuse with records for non-abused children and found that adults with a history of sexual abuse were 38 percent more likely to be arrested for a violent crime.

*Violence Approval* - The Violence Approval Scale examines the extent to which use of physical force is acceptable in a variety of interpersonal situations. Researchers have long known that individuals with a greater amount of violence approval are more likely to commit crimes than those with lower levels of violence approval. Individuals

who accept violence as a means of controlling a partner were found to be at increased risk of perpetrating IPV against their partner and of being in a relationship with bi-directional IPV (Prospero, Dwumah and Ofori-Dura, 2009).

*Violence Socialization* – Childhood observations of IPV have long been known to impact later beliefs about aggressive behavior (Stith & Farley, 1993). Perpetrators of IPV are more likely than non-violent men to have grown up in homes with aversive family communication (Andrews et al., 2000), parental violence (Ehrensaft et al., 2003), incompetent or punitive parenting (Capaldi & Clark, 1998), and child abuse and maltreatment (Ehrensaft et al., 2003). In fact, exposure to IPV appears to alter one's beliefs about violence even during childhood.

*Limited Disclosure Scale* – Responses to the questions in an instrument such as the PRP are influenced by willingness to report socially undesirable behaviors. The Limited Disclosure (LD) scale can help deal with this threat to validity. When the PRP is used in research, scores on the LD scale can be included as a covariate as was done in most of the studies listed in the section on the validity of the PRP. In clinical applications, high scores on the LD scale indicate that scores on the other PRP scales should be evaluated with caution.

## DANGER ASSESSMENT

Unlike the PRP, which is completed by perpetrators, the Danger Assessment (DA; Campbell, 1986) is a violence risk assessment tool designed for female victims. Questions on the DA are designed to assess several risk factors associated with IPV such as the male's history of violence and incarceration, his use of violence to obtain sex, access to weapons and his history of substance abuse. The measure also assesses relationship

variables such as his level of jealousy and the degree to which she believes he attempts to control her daily activities. The DA is commonly used as a means of victim education, safety planning and service provision (Roehl et al., 2005). It is also a good predictor of IPV recidivism and homicide. A retrospective validation study of the DA compared cases of femicide with cases of IPV in which the female victim was not killed. This study found that 90% of the cases included fell within the receiver operator curve (ROC) suggesting that the DA is adept at identifying cases of lethal IPV in relation to non-lethal IPV (Cambel, Webster, & Glass, 2008). Roehl et al. (2005) examined data provided by 1,307 battered women and compared the test results of the DA with two other risk assessment questionnaires and the victims' perception of risk. The DA had the highest correlation with subsequent abuse, although the correlation was small ( $r = .38$ ). The DA also performed well at predicting threats.

### **THE CURRENT STUDY**

Four models will be examined to ascertain which has the greatest utility in predicting whether or not a perpetrator has a history of incarceration related to IPV. A neural network model containing perpetrator report only, a neural network model containing perpetrator report and victim report, a linear model containing perpetrator report only and a linear model that includes perpetrator and victim report will be compared.

### **THE BENEFITS OF IMPROVING MODELS**

Unfortunately, research strongly suggests that even when batterers are provided with legal and psychological interventions, their recidivism rates remain high. In a study of four geographically distributed cities, an average of 32% of women reported that they

were re-assaulted during a 15 month follow-up period (Gondolf, 1999). That rate increased to 42% at a 48 month follow-up. This was despite the fact that 82% of the men had been court ordered to participate in a program designed to reduce violent recidivism. Buzawa et al. (1999) found similar results in a study that employed a phone interview with victims of IPV. The study revealed that 50% of the women reported having been re-assaulted within one year of their initial assessment. Steinman (1990) examined criminal justice records and found that 56% of batterers reoffended and that when examining individuals with a history of criminal behavior, the recidivism rate remained the same even when the batterer was provided with a structured intervention involving both law enforcement and counseling. Puffet and Gavin (2004) examined data collected from defendants of domestic violence crimes in the Bronx Misdemeanor Domestic Violence Court. They found that 8% of defendants had been rearrested before their first case reached disposition. Sixty-two percent of all defendants were rearrested within two years regardless of the type of treatment they received (domestic violence treatment, substance abuse treatment or both). Given the previously discussed impact IPV has on the female partner, children and the community, it is clear that there is much to gain in terms of public safety from being able to accurately predict which men are likely to re-assault their partners and which are not.

Improving models for predicting recidivism would save tax payers a considerable amount of money. The average cost of housing an inmate in a federal prison was \$28,284 during the 2010 fiscal year (Department of Justice, 2011). With over 1.6 million inmates in state and federal prisons (West, 2010) it is no wonder that many are calling for changes in the way our society manages inmates. Reducing the number of inmates in prison

would significantly reduce state and federal budget shortfalls. Unfortunately, many are hesitant to release inmates back into the public via parole or probation because of the liability inherent in releasing a person with a criminal history. This hesitance appears well founded given our poor ability to predict which inmates will re-offend and which will not. As we develop more reliable methods of predicting future criminal behavior, perhaps parole and probation will become more common, thus saving millions of dollars every year.

### NEURAL NETWORKS

Neural networks are similar to multiple regression models with the exception that they use a new class of nonlinear forms. For example, rather than using the sum of squared errors, neural networks use nonlinear procedures such as back propagation (Rumelhart et al., 1986.) and quick propagation (Fahlman, 1989) to create a model that best fits the data. Caulkins et al. (1996) suggest that due to the flexibility of neural networks they may be particularly useful when there are: “(a) inadequate theories for full model specification, (b) rich collections of independent variables with complex interactions, (c) subtle nonlinearities, or (d) distinct sub-models of unique behaviors.”

Neural networks are particularly adept at identifying the kinds of adaptive and nonlinear systems found in biology and the social sciences. They are commonly used today in many applications such as real estate appraisal, stock price prediction, and voice and image recognition software (Lawrence, 1994). One of the greatest strengths of neural networks is their ability to adapt. Once the network designer sets up the basic parameters of the model, such as the number of neurons and the learning rate, data is put into the model. The model will examine the input and give a certain output. That output is then

compared to the correct outcome and if the actual outcome does not match the desired output the model makes small adjustments to the connections between the neurons and tries again with the next piece of input. As this process is repeated, the model becomes increasingly adept at predicting the correct output based on the specific input it is given (Principe, Euliano, & Lefebvre, 2000).

Debate exists about whether neural network models are better suited for applications in the social sciences than traditional linear models. Some argue that neural networks are more flexible and better suited for the non-linear relationships often found in complex, real-world applications. For example, Pao (2008) found that neural networks were better able than regression models to predict debt ratio and identify important determinants of capital structure among various industries in Taiwan. Barcelos-Tronto, da Silva and Sant'Anna (2007) found that neural networks were more effective than linear models in predicting the amount of resources a manager would need to allocate to a particular project and argues that neural nets may save companies a great deal in time and money because of the superior predictive ability. Neural networks have been successfully applied in medical settings as well. Liew et al., (2010) created a neural network model that outperformed its linear counterpart in its ability to predict mortality and disease free survival. Neural networks also performed better in a study of gallbladder disease among obese patients in terms of their ability to predict development of gallstones.

However, a body of research exists which suggests that neural networks are no more effective than linear models. Jaimes and colleagues (2005) compared the two models in their ability to predict death in patients with suspected sepsis in the emergency room. Their models included 5 factors relevant to the prediction of sepsis related death.

Neither model was superior. The authors argued that logistic regression remains the best choice for such prediction. The models have also demonstrated similar ability to predict the development of breast cancer on the basis of mammographic descriptors and demographic risk factors (Ayer et al., 2009). Perhaps the discrepant findings can best be illustrated by the results of a meta-analysis conducted by Sargent (2001). In 28 studies comparing the use of neural nets with regression models in medical settings, neural nets outperformed regression in 10 cases, was outperformed by regression in 4 cases and the two models performed similarly in the remaining 14. However, in the 8 studies that included a sample size of 5,000 or more, regression and neural nets performed similarly in 7 studies and regression was superior in the remaining case. Given the discrepant findings across numerous fields, and the potential benefits of successfully applying the correct model to a particular problem, it is apparent that more research needs to be conducted to determine under what circumstances each model is superior.

The current study will create four models designed to predict history of arrest. One linear model will include only data collected from the perpetrator of IPV, while a second linear model will add information collected from the partner of the perpetrator. Similarly, two neural networks will be created, one lacking data from the partner and the other will include the partner's data. To use the perpetrator only model as an illustration, the neural network will be given information on each of the relevant variables for a particular male. The model will rate the importance of each variable, guessing, for example, that a history of substance abuse is more important than a history of childhood abuse. The model will then guess as to whether that particular male has a history of arrest or not. If the model is correct then no adjustments will be made to the model. However, if

the model is incorrect regarding his arrest history then minor changes will be made such as increasing the importance of violent history or reducing the importance of a history of childhood abuse. This method of going backwards through the model to improve its accuracy is known as back propagation. At the end of the process, the model will likely have learned very complex relationships between these variables and be able to use those relationships to more accurately predict a history of arrest. After the neural network has analyzed the testing portion of the data and created a model that most accurately predicts a history of arrest, the model will then be tested using the remaining data. The model's ability to accurately predict which men have a history of incarceration and which do not will then be measured via several comparison criteria discussed below. It is hypothesized that the neural network models will be better able to predict history of arrest in perpetrators of IPV than linear models and that models that include victim report will outperform those that lack victim report.

### Method

#### **PARTICIPANTS**

Adult, heterosexual couples with a history of IPV were recruited for this study through newspaper advertisements. To meet inclusion criteria, women must have reported two or more male-to-female acts of violence in the past year. To meet criteria for the distressed/nonviolent group, women must have reported no violence in the past year, no serious violence ever, and a score of 5 or lower on a 7-point scale of relationship satisfaction.

Participants were recruited from a large city in the Southern United States. The advertisement specified that couples must be 18 years of age or older, married or living

together as if married for at least 6 months, and be able to read and write in English (N=92). Twenty of those couples failed to adequately complete the necessary measures leaving 72 participants to be included in the analyses. The mean age of the batterers was 32 with a range of 19 to 52 years of age. Nearly one-third of the participants reported they were unemployed at the time of the study. The mean income was approximately \$30,000 per year with the highest earner reporting annual income of \$130,000. The average length of time that couples had been in their current relationship was 6 years. The racial make-up of the sample consisted of African Americans (56%), Caucasians (26%), Latino (10%), Asian (6) and those who selected "Other" (3%). Roughly half (56%) of the males reported having children. No participants reported having abused their children or of having knowledge of children being abused.

Of the male batterers, 60% reported a history of arrest and 10% had been arrested on a domestic violence charge. Seven percent reported having been arrested on both a domestic violence charge and a charge other than domestic violence. Nearly one-third of the males had a history of incarceration in either a jail or prison. Of those with a history of incarceration, the majority had only been incarcerated once. The participant with the greatest number of incarcerations had been in prison or jail 5 times. The shortest length of incarceration was 2 weeks and the longest was 192 months with a mean of 39 months.

## **PROCEDURES**

Data were collected as part of a larger study of intimate partner violence (Babcock, Roseman, Green, & Ross, 2008). Female partners were screened over the phone. During the first 3 hour session, only men completed questionnaires and participated in computer-based tasks. Men were paid \$30 for participation in this session.

During the second 3 hour session, male and female participants completed questionnaires including the PRP and DA, and discussed an area of disagreement while video monitors recorded their facial affect, and sensors recorded their autonomic arousal. For safety, both members of the couple were separately interviewed and independently debriefed to answer any questions and to assess their present levels of anger, the partners were reunited and paid \$35 each for their participation.

### SAFETY MEASURES

In order to maintain the safety of the participants, safety procedures developed by Dr. Anne Ganley were used (Babcock et al., 2005). Following the assessment, participants were placed in separate rooms and debriefed to assess danger and safety. When necessary, safety plans were developed. All participants received referrals for community resources including, but not limited to, counseling services, hotline numbers, and shelters. Female participants were telephoned one week later to determine if their participation in the research project had caused any negative events. In no cases did women report violence due to participation in the assessments.

### MEASURES

*Intake Questionnaire* – Each participant completed an intake questionnaire designed to collect simple background and demographic information regarding the male, the female and their relationship.

*The Personal and Relationship Profile*- The Personal and Relationship Profile Form P2 (PRP; Straus et al., 1996) is a 187 item, 22 scale measure designed for research on intimate partner violence and as a screening tool in clinical settings. Research suggests that both personal characteristics and relationship characteristics play a role in domestic

violence. Thus, the PRP assess for 14 personal variables and 8 relationship variables. Each item assesses a particular trait of the individual or of the relationship. The items are scored 1 (strongly disagree), 2 (disagree), 3 (agree), 4 (strongly agree). The design of the personal and relationship profile (PRP) follows four principles: the items are declarative statements about the respondents or their partners; the respondents are asked the degree to which they agree to the statements; responses are made using a four point likert scale; and all items are at the 5th or 6th grade reading level. The 22 variables that are included in the PRP have strong empirical support linking them to IPV. Table 1 illustrates the alpha coefficient of internal consistency reliability for student and community samples of the PRP as discussed in Straus, 2009.

Data on the PRP's reliability is based on analyses of two large samples. One sample came from the International Dating Violence Study (IDVS). The IDVS sample consists of 17,404 students from 68 universities in 32 countries. Data for the PRP's validity consisted only of data collected in the United States and only in couples that had been in a romantic relationship for at least one month (N = 4,533, 3,074 women, 1,459 men). See Straus (2008) for additional details on the sample.

Concurrent validity is agreement between the measure being evaluated and other, presumably valid measures of the same construct. The degree of validity is indicated by the size of the correlation between the two measures. Straus (2009) examined the correlation of nation-to-nation differences in scores on eight PRP scales with nation-to-nation differences in other measure of these eight variables. The sources of the other measures were other surveys and national health and crime statistics. These procedures are described in detail in Straus (2009). Table 2 summarizes the results for eight

concurrent validity correlations, which provide strong evidence for the PRP's concurrent validity with similar measures.

The first row of Table 2 shows the correlation of the PRP Dominance scale with the United Nations Gender Empowerment Index (United Nations Development Programme (<http://hdr.undp.org/>)). The standardized regression coefficient is  $-.69$  ( $p < .01$ ). Thus, the Dominance scale scores for the men in this study are highly consistent with the widely used Gender Empowerment Measure. This correlation is remarkably high given the very different nature of the two measures. One is the report of male students about their dating relationships, and the other is a compilation of national statistics, such as the female percent of seats in parliament; female proportions of senior officials, managers, professional and technical; and the ratio of female to male earnings. The correlation of the PRP Depressive Symptoms scale with the Beck Depression Inventory (Beck, Steer, and Brown 1996) for 12 nations (van Hemert, van de Vijver, & Poorting, (2002) found to be  $.43$ . The other correlation with the PRP Depressive Symptoms scale is very low ( $.18$ ). The authors believe this is because the other measure of depression consists of a single question.

The mean correlation for the eight correlations in Table 2 is  $.56$ , despite the fact that one of the eight is a very low correlation due to limitations of the measure of depression with which we correlated the PRP Depressive Symptoms scale. A limitation of the results presented in this section is that cases are nations rather than individual persons.

Construct validity is established on the basis of the degree to which studies using the measure being evaluated find relationships to other constructs that are consistent with

empirical or theoretical information on what the construct being evaluated is or should be related to. For example, if a measure of violence approval is found to be related to actual acts of physical violence that would add to the evidence of validity. If, however, no relation is found between the measure of violence approval and actual acts of physical aggression, that would subtract from confidence in the construct validity of the violence approval measure. Construct validity cannot be established by a single coefficient. Rather it is a judgment based on a number of analyses across different studies. Table 3 shows that many analyses have found that PRP scales are correlated with other variables for which previous research or theory leads to the expectation of a relationship. All the relationships identified in Table 3 controlled for a number of possible confounds, including for almost all, score on a scale to measure socially desirable responding, i.e. limited disclosure of socially undesirable behavior or beliefs.

*The Danger Assessment-* The Danger Assessment (DA; Campbel, 1986) is a tool designed to assess the likelihood of serious injury or death occurring as a result of IPV. The DA originally consisted of 15 items selected based on previous research on factors related to IPV as well as input from women in battered women's shelters. Questions are designed to assess several risk factors associated with IPV such as the male's history of violence and incarceration, his use of violence to obtain sex, access to weapons and his history of substance abuse. The measure also assesses relationship variables such as the number of children and step-children the couple have, his level of jealousy and the degree to which he attempts to control her daily activities. Other items more directly assess his level of violence by measuring whether or not his violence is increasing in severity, if he has choked his victim, his history of threats to commit suicide and history of suicide

attempts (Campbell, Webster, & Glass, 2009). Item 14 of the DA is related to child abuse and was omitted from the DA as an endorsement of that item would mandate a report to Child Protective Services.

## **COMPARISON CRITERIA**

When assessing the accuracy of recidivism prediction models, the most commonly used indicators are: (a) the false-positive rate (FPR) which is the proportion of non-recidivists incorrectly predicted by the model as recidivists, and (b) the false-negative rate (FNR) or the proportion of recidivists incorrectly predicted as being non-recidivists and (c) the percentage of total correct predictions (TCP) (Caulkins, Cohen, Gorr& Wei, 1996). One limitation of FPR, FNR and TCP is that these scores are influenced by the base rate of recidivists found in the sample. Thus, the FPR, FNR and TCP do not generalize beyond the sample and are not particularly useful in cross-study comparisons of the effectiveness of prediction models Cohen and Zimmerman (1990).

In addition to the criteria employed by Caulkinsand colleagues (1996), Receiver Operating Characteristic (ROC) analyses were conducted. The ROC is a graphical plot of the true positive rate against the false positive rate for binary classifiers. The ROC analysis provides tools to compare various models and select those with optimal performance. A plot displays a diagonal line that marks chance classification as well as a curve marking the models classification. Larger areas under the curve (AUC) values represent higher levels of accuracy. This analysis calculates the sensitivity and specificity of each risk factor combination as well as the chances of correctly identifying those with a history of incarceration and those without. Sensitivity refers to the likelihood a test will produce a positive result when the condition is present (true positive) and specificity

refers to the likelihood that a test will produce a negative result when the condition is not present (true negative). An AUC value of 0.80 or above suggests the model has good accuracy levels (Goring et al., 2004). Good models also typically possess a sensitivity above 80% and specificity of 60% or better.

### Results

#### DESCRIPTION OF MODELS

SPSS 20 was used to construct several neural network models which varied in the number of hidden layers and the number of neurons in each hidden layer. The two supervised neural network models with the best performance were included in the analyses. The most effective model was comprised of one hidden layer with two neurons in the hidden layer.

The most common procedure for creating and testing neural networks involves the software randomly selecting 70 percent of the data to “train” or create the network. The network is created using a feed forward method in which data from the independent variables of one participant is placed into the model first. Then the software makes an estimate as to how each variable should be weighted in order for the model to most accurately predict the outcome. After the software has estimated a weight for each independent variable, the model will make a guess as to which category the participant is a member. If the model makes a correct prediction, the model remains the same and the data from the next participant is placed into the model. If the model is incorrect, changes are made to the model prior to data from the next participant being examined. This process is repeated many times, until the model is not longer able to improve its ability to make an accurate prediction by changing the weights of the model. This method of

changing the weights in successive approximations until the best model has been reached is known as the back-propagation method. Once the model has been created using 70 percent of the data, its accuracy is validated on the remaining 30 percent of the data.

Both neural networks employed a hyperbolic tangent activation function. During the construction of the neural network models, the stop rule was one step without a decrease in error. Cross validation was used to prevent over-training of the model and minimize the generalization error. By partitioning the data into subsets, analyzing one subset and comparing the results to the second subset, the model is prevented from “over-learning” the training data. A visual representation of the neural network which excluded the victims report can be found in Figure 1. A representation of the neural network model that included victim report can be found in Figure 2.

Regression models were also created and tested with SPSS 20 using the Stepwise (Backward/Wald) method. The logistic regression model analyses included Hosmer-Lemeshow goodness of fit chi-square. The models were created using a stepwise method which initially included all 23 variables used in the neural network model. This method was chosen because the performance of linear models is often negatively impacted as the number of variables included in the model increases. One reason for this is that with each additional variable added to the model, the degrees of freedom increases, which reduces the power of the model. Secondly, an assumption of the linear model is that the variables within the model are not highly correlated. The more variables found in the model, the greater the likelihood that this assumption will be violated. Hosmer-Lemeshow Chi-Square was 2.73 (df = 8, p = .950) for the logistic regression model that included only the perpetrator’s information. The Hosmer-Lemeshow Chi-Square for the model that

included the victim report was 4.18 ( $df = 8$ ,  $p = .841$ ). Both linear models demonstrated an improvement over the null model. A summary of the linear models can be found in Tables 4 and 5.

### PERFORMANCE OF MODELS

The performance of all four models across all four criterion can be found in Table 6. Among FPR, FNR and TPC, the TPC value is most commonly reported in studies that compare classification models as it is the simplest to interpret. The TPC of the neural networks is higher than the regression models, suggesting that neural networks correctly classify a higher percentage of the participants than linear models. Although the FPR, FNR and TPC are useful indicators of the models performance, they cannot be directly compared to determine which model was most effective. The Receiver Operating Characteristic is a graph used to illustrate and evaluate the performance of a model used in binary classification. The Area Under the Curve is a value that allows for direct comparison of the models by comparing the relative ratio of sensitivity to specificity for each model. It is essentially a measure of the models ability to classify a participant. As was hypothesized, neural network models were more effective than the linear models in predicting history of arrest, and models that included victim report outperformed models that did not include victim report. Illustrations of the ROC curves appear in Figures 3 through 6.

## Discussion

### IMPLICATIONS

When compared to linear models, the neural networks were better able to predict which participants had a history of arrest, as evidenced by their superior AUC values. This suggests that non-linear models such as neural networks may prove more useful in real-world settings when the goal is classification of complex phenomena. Neural Networks may be particularly adept at predicting specific means of recidivism such as IPV as they have fewer of the limitations of linear models that were discussed earlier.

Models that included victim report outperformed models that did not include victim report, although by only a marginal amount. The current study found that the addition of a second source of information would enhance the model's predictive power. For both the linear approach and the neural network approach, the models that included victim report performed slightly better than models that did not include victim report. This suggests that adding victim report data may improve the ability of judges, parole boards etc. to predict who will commit acts of domestic violence in the future and who will not. It is likely that additional sources of information such as parole officers, family members and others who know the perpetrator will increase our predictive ability as well.

Tu (1996) and others continue to argue that logistic regression is the clear choice when the goal of model development is to examine causal relationship among variables. This study contributes to the growing body of evidence suggesting that neural networks are superior to standard linear models. There has recently been a call to develop models that incorporate both regression and neural network models because a serious limitation of neural networks is their tendency to over-fit the data during the training process, which

limits the models performance during testing (Barcelos, Tronto, da Silva, & Sant'Anna, 2006). Regression models have less potential for over-fitting because the range of functions they can model is more limited. Therefore, hybrid models combining the linear and neural network models may be preferable. For example, Duh and colleagues (1998) have developed models for newly diagnosed cases of liver disorders by combining the two approaches. Hajmeer and Basheer (2003) have combined linear and neural networks to model e-coli growth. Attempts at combining the models focuses on using linear models to set parameter limits to constrain the neural network and prevent over training. Future research in this area would do well to examine the strengths and weaknesses of the two approaches and design models that incorporate the best of both.

This study suggests that non-linear models that include corroborating reports, such as victims' reports, may be more useful in clinical and forensic settings. Given the serious consequences of domestic violence, any improvement in our ability to predict recidivism may save not only money in legal and correctional costs but also lives. IPV causes tremendous physical and emotional pain. The modest improvement in prediction garnered by the use of these models may save the life of someone that would have otherwise been a victim of recurrent domestic violence by allowing the justice system to identify those likely to recidivate and giving them longer sentences, mandated treatment and other measures designed to protect society. One advantage of neural networks is that they can be developed into software and copy-written. As these models become increasingly accurate, it is easy to imagine a computer program that allows a judge/parole board/clinician to input a perpetrator's data on various measures and receive specific information about his risk/protective factors and likelihood of recidivism.

## LIMITATIONS

A limitation of this study is that it is based on retrospective reports of arrests and incarceration. Ideally, one would conduct a prospective, longitudinal study of identified batterers and predict via neural network models subsequent arrest and incarceration. Hagan and King (1997) note that few studies have actually developed tools for predicting recidivism and tested them via longitudinal studies on former inmates. Like many previous studies, this study used an analogue design, using history of incarceration as a proxy for future recidivism.

Another significant limitation is the reliance on self- and partner-reported history of arrest and incarceration rather than reliance on police records. Although police reports and records are also problematic (e.g., offenders may move jurisdictions, records may be expunged due to deferred adjudication), corroborating police reports would be useful as an adjunct outcome variable. Similarly, arrest for domestic violence often depends upon the victim notifying police of the violence. It may be the case that men released from jail or prison continue to abuse their victim, but are not re-arrested and thus are considered “non-recidivists.”

A relatively small sample was employed in the current study. Although small *N*'s have been found to reduce the efficacy of both types of models, there has been research conducted that demonstrates both linear and neural network models are equally impacted by small *N*'s (Clermont et al., 2001). Thus, while the small sample size may have affected model fit, it did not likely impact the relative performance of the models.

## FUTURE DIRECTIONS

Additional studies should be longitudinal in nature, using clearly defined criteria for measuring recidivism. Longitudinal studies would allow for an analysis of how these predictor variables change over time and would add a layer of complexity to the prediction that would be well suited for non-linear models. In an applied setting, data could be collected from individuals recently released on parole and that data could be continuously added to the model, thus increasing the predictive power of the model as it has the most recent information regarding the parolee.

There are various types of neural networks that have been developed, each differing in the method by which they arrive at a final means of classifying a participant. For example, Radial basis function networks and Kohonen self-organizing networks differ from the feed-forward network used in the current study. Additional research exploring these various types of networks and their ability to discriminate between recidivists and non-recidivists may be of further use to professionals who must make decisions regarding sentencing, probation and parole. This study suggests that additional sources of information may make significant improvements in model performance. Thus, future studies should examine which sources of information are most useful. It may be beneficial to examine the cost of obtaining this additional information. It is possible that although gaining collateral information aids the model, the cost of obtaining such information may outweigh the benefits.

Table 1

*Alpha Coefficient Of Internal Consistency Reliability For Student and Community Samples*

|                                                                                                                                  | Student<br>Sample | Community<br>Sample |
|----------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| <b>Measures of Individual Characteristics and Experiences</b>                                                                    |                   |                     |
| ASP Antisocial Personality Symptoms                                                                                              | .73               | .77                 |
| BOR Borderline Personality Symptoms                                                                                              | .76               | .74                 |
| CH Criminal History                                                                                                              | .80               | .87                 |
| DEP Depressive Symptoms                                                                                                          | .83               | .79                 |
| GHM Hostility to Men                                                                                                             | .80               | .77                 |
| GHW Hostility to Women                                                                                                           | .75               | .72                 |
| LD Limited Disclosure                                                                                                            | .71               | .70                 |
| NH Neglect History                                                                                                               | .73               | .73                 |
| POS Positive Parenting                                                                                                           | .74               | .69                 |
| PTS Post-Traumatic Stress Symptoms                                                                                               | .72               | .72                 |
| SUB Substance Abuse                                                                                                              | .81               | .83                 |
| SC Self-Control                                                                                                                  | .64               | .67                 |
| SI Social Integration                                                                                                            | .65               | .67                 |
| STR Stressful Conditions                                                                                                         | .67               | .69                 |
| SAH Sexual Abuse History                                                                                                         | .82               | .81                 |
| VA Violence Approval                                                                                                             | .70               | .69                 |
| VS Violent Socialization                                                                                                         | .74               | .78                 |
| <b>Measures Of Couple Relationships</b> (scales which include items that refer to behavior towards or beliefs about the partner) |                   |                     |
| AM Anger Management                                                                                                              | .62               | .61                 |
| CP Communication Problems                                                                                                        | .68               | .66                 |
| CON Conflict                                                                                                                     | .79               | .74                 |
| DOM Dominance                                                                                                                    | .66               | .66                 |
| JEL Jealousy                                                                                                                     | .84               | .75                 |
| NA Negative Attribution                                                                                                          | .74               | .69                 |
| RC Relationship Commitment                                                                                                       | .68               | .71                 |
| RD Relationship Distress                                                                                                         | .86               | .78                 |

Table 2

*Concurrent Validity Evidence For The Personal And Relationships Profile*

| PRP Scale                                                 | Other Measure                                                                              | N*  | r    |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------|-----|------|
| Dominance                                                 | Gender Empowerment Measure (United Nations, 2005)                                          | 29  | -.69 |
| Alcohol Abuse                                             | Alcohol consumption in 37 Nations (Eisner, 2002)                                           | 19  | .50  |
| Alcohol Abuse                                             | Alcohol problem usage – Europe (Eisner 2002)                                               | 12  | .56  |
| Antisocial Personality Symptoms                           | Violent crime – Europe (Eisner 2002)                                                       | 12  | .63  |
| Binge Drinking                                            | Binge drinking – US regions (U.S. Dept. of HEW)                                            | 13* | .81  |
| Depressive Symptoms                                       | Depression (Van Hemert, Van De Vijver, and Poortinga 2002)                                 | 12  | .43  |
| Depressive Symptoms                                       | Felt depressed in past few weeks, World Values Study (Inglehart, Basanez, and Moreno 1998) | 20  | .18  |
| Relationship Distress scale                               | Satisfaction with home life, World Values Study (Inglehart, Basanez, and Moreno 1998)      | 21  | -.66 |
| *N is the number of nations for which data was available. |                                                                                            |     |      |

Table 3

*Construct Validity Evidence For The Personal And Relationships Profile*

| <b>PRP Scale</b>                                                                                                                                                                                                                                              | <b>Significantly related to</b>                                           | <b>Reference</b>                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------|
| Alcohol Abuse<br>Antisocial Personality                                                                                                                                                                                                                       | Physically assaulted partner                                              | (Hines and Straus 2007)                     |
| Alcohol Abuse (Russian data)                                                                                                                                                                                                                                  | Physically assaulted partner                                              | (Lysova and Hines 2008)                     |
| Borderline Personality Symptoms                                                                                                                                                                                                                               | Physical assaulted partner<br>Psychological aggression<br>Sexual coercion | (Hines 2008)                                |
| Criminal history                                                                                                                                                                                                                                              | Physically assaulted partner                                              | (Ramirez 2005)                              |
| Depressive symptoms<br>Post traumatic stress symptoms                                                                                                                                                                                                         | Poly-victimization by a dating partner                                    | (Straus 2008)                               |
| Dominance                                                                                                                                                                                                                                                     | Physically assaulted partner                                              | (Straus 2008)                               |
| Neglect History                                                                                                                                                                                                                                               | Physically assaulted partner                                              | (Straus and Savage 2005)                    |
| Post Traumatic Stress Symptoms                                                                                                                                                                                                                                | Physical assault of a dating partner                                      | (Hines 2007)                                |
| Self-Control                                                                                                                                                                                                                                                  | Violent crime and property crime                                          | (Rebellion, Straus, and Medeiros 2008)      |
| Violence Approval                                                                                                                                                                                                                                             | Gross Domestic Product                                                    | (Mattingly and Straus 2008)                 |
| Violent socialization                                                                                                                                                                                                                                         | Approval of corporal punishment                                           | (Douglas 2006)                              |
| Anger Management, Antisocial Personality, Borderline Personality, Criminal History, Relationship Conflict, Communication Problems, Dominance by one partner, Jealousy, Negative Attributions, Neglect History, Sexual Abused as child, Pro-Violence Attitudes | Physically assaulted partner (Both male and female perpetration)          | (Medeiros and Straus 2006)                  |
| Antisocial Personality, Borderline Personality, Criminal History, Gender Hostility, Neglect History, Social Integration, Violence Approval Anger Management, Communication Problems, Jealousy, Negative Attribution, Age, Relationship Length                 | Physical assaulted partner<br>Suicidal ideation                           | (Chan, Tiwari, Leung, Ho, and Cerulli 2007) |

Table 4

*Summary of Logistic Regression Analyses in model that did not include victim report*

| Variables in the Equation |       |       |        |
|---------------------------|-------|-------|--------|
|                           | B     | S.E.  | Exp(B) |
| Conflict                  | .669  | .663  | 1.952  |
| SexAbuseHx                | .946  | .599  | 2.575  |
| RelDistress               | .196  | .593  | .822   |
| SubstanceAb               | 2.210 | .618  | .110   |
| Constant                  | .926  | 1.569 | 2.523  |

# TESTING THE UTILITY OF NEURAL NETWORK MODELS

Table 5

*Summary of Logistic Regression Analyses in model that included victim report*

|             | B     | S.E.  | Exp(B) |
|-------------|-------|-------|--------|
| Conflict    | .660  | .664  | 1.935  |
| SexAbuseHx  | 1.032 | .614  | 2.807  |
| RelDistress | .173  | .599  | .841   |
| SubstanceAb | 2.205 | .632  | .110   |
| DASum       | .204  | .233  | .816   |
| Constant    | .947  | 1.574 | 2.578  |

Table 6  
*Comparison of regression and neural network models*

| Model                                  | FPR | FNR | TCP | AUC  |
|----------------------------------------|-----|-----|-----|------|
| Neural Net-<br>Male data<br>only       | 19% | 25% | 85% | .962 |
| Regression –<br>Male data<br>only      | 39% | 32% | 65% | .809 |
| Neural Net –<br>Victim<br>report incl. | 17% | 20% | 85% | .964 |
| Regression –<br>Victim<br>report incl. | 34% | 24% | 69% | .812 |

Figure 1. Neural Network Model Excluding Victim Report

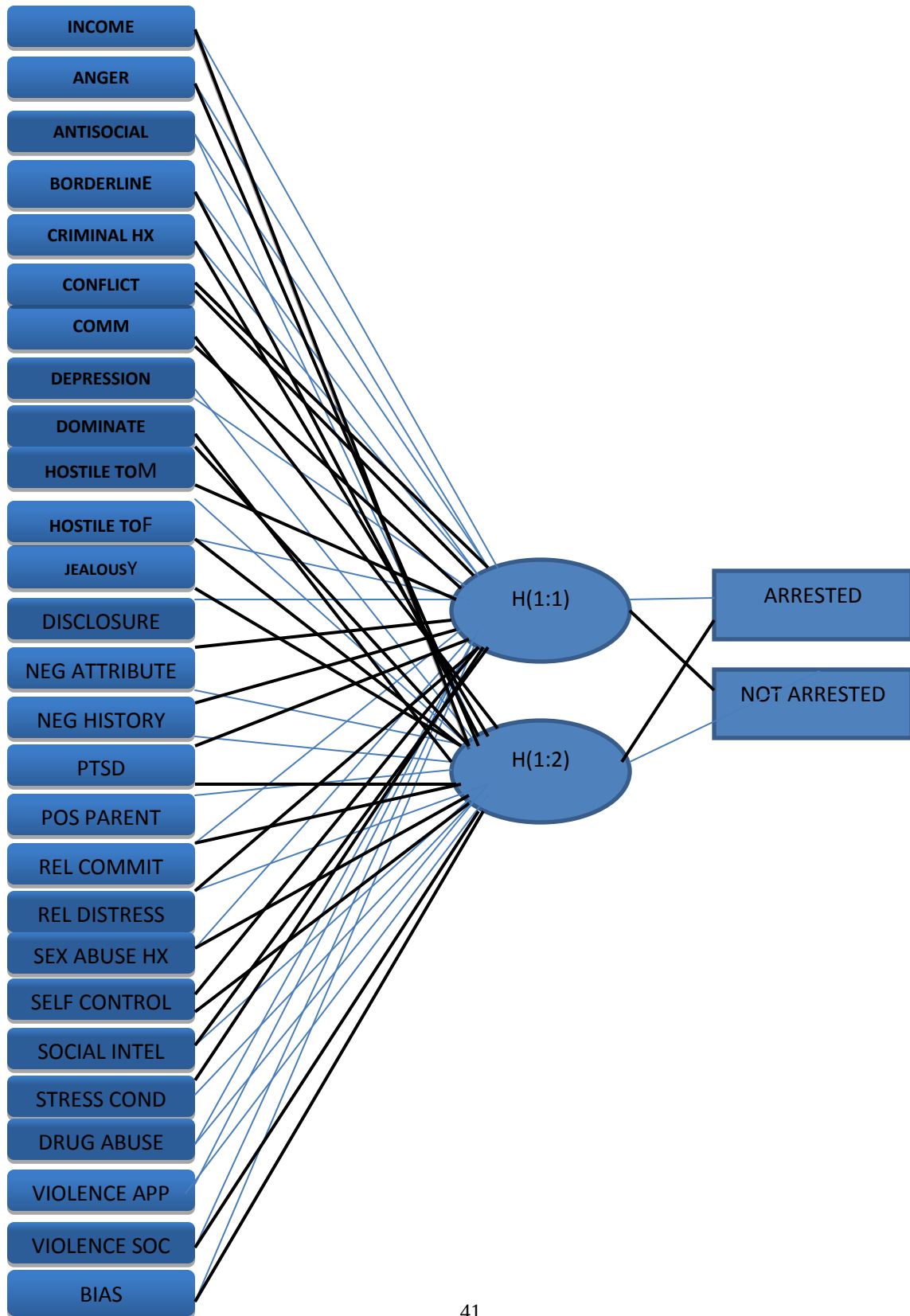


Figure 2. Neural Network Model Including Victim Report

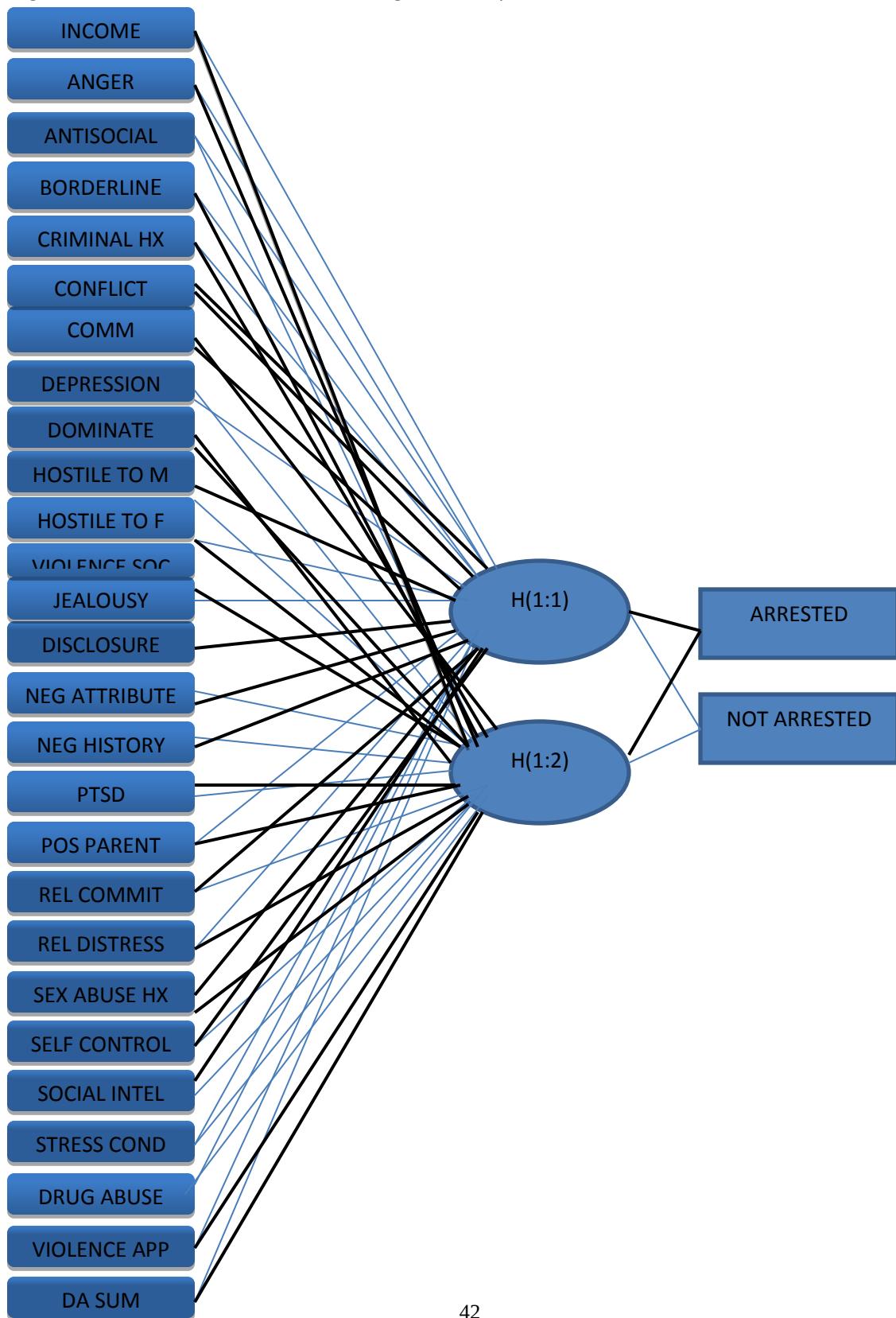


Figure 3. ROC curve for neural network excluding victim report

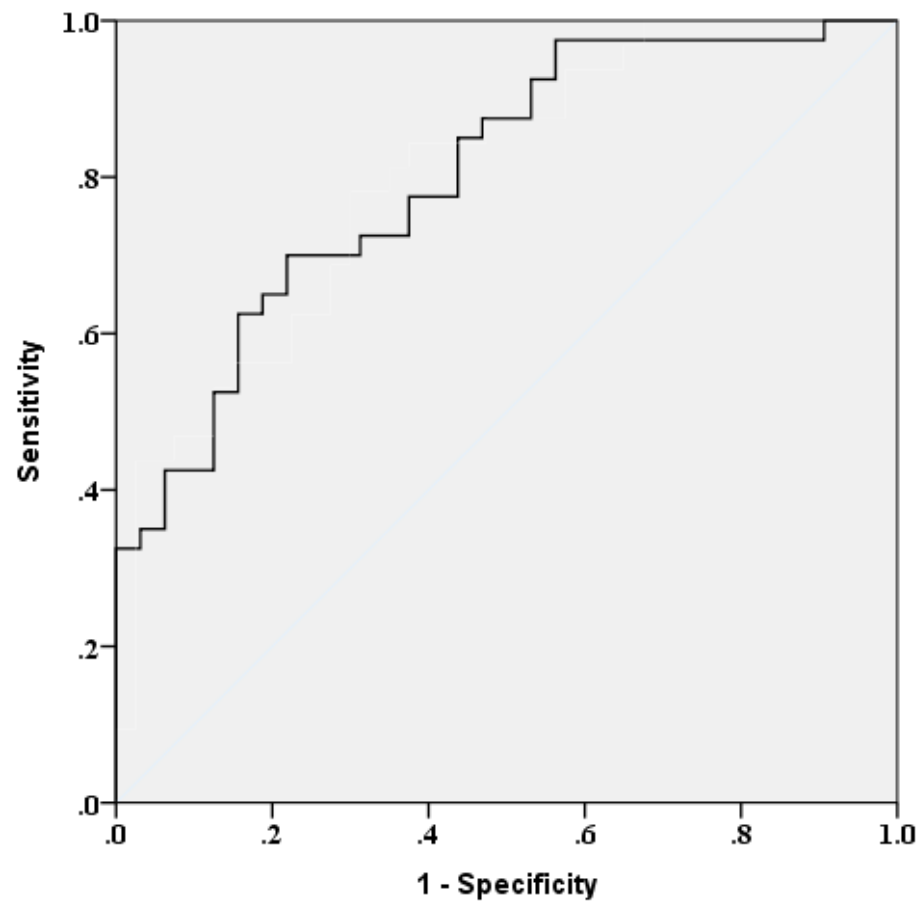


Figure 4. ROC curve for neural network including victim report

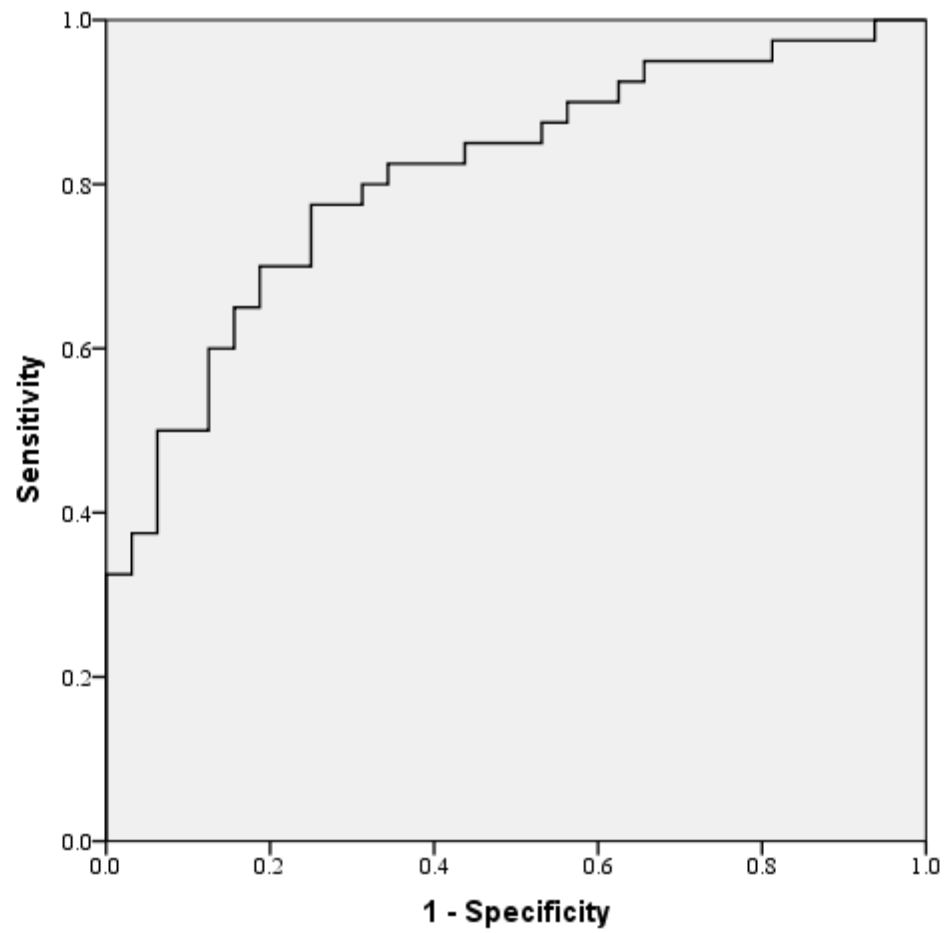


Figure 5. ROC curve for linear model excluding victim report.

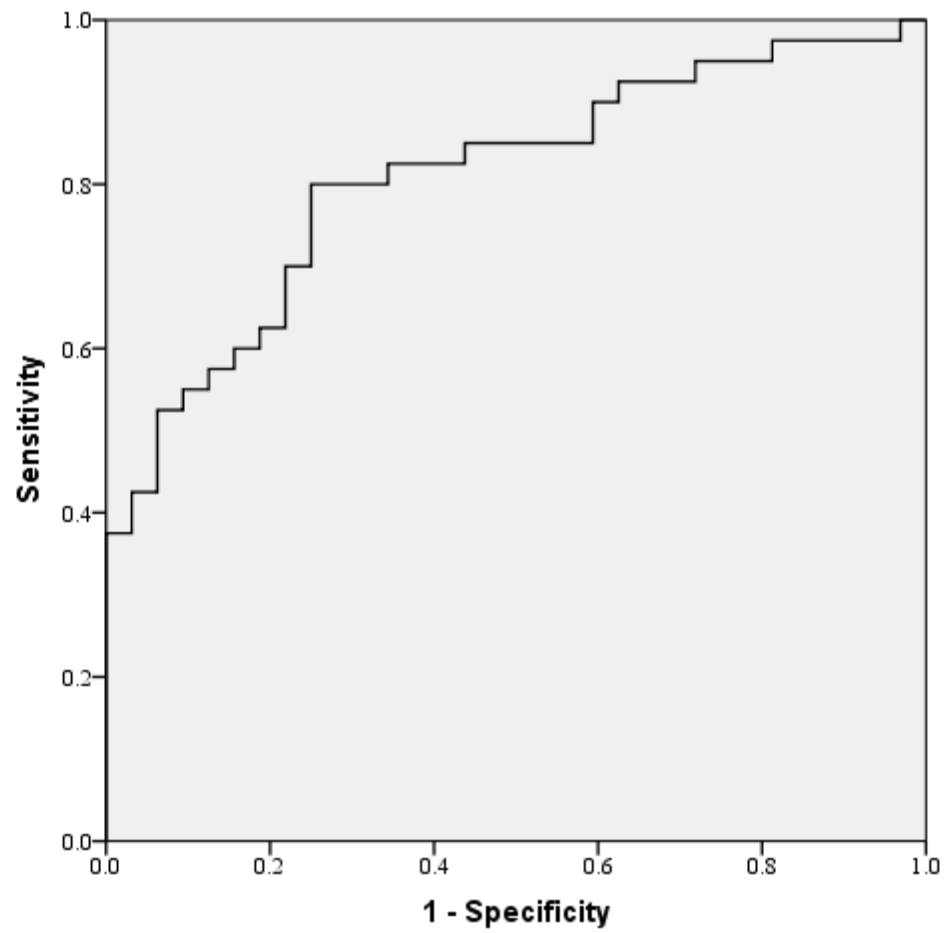
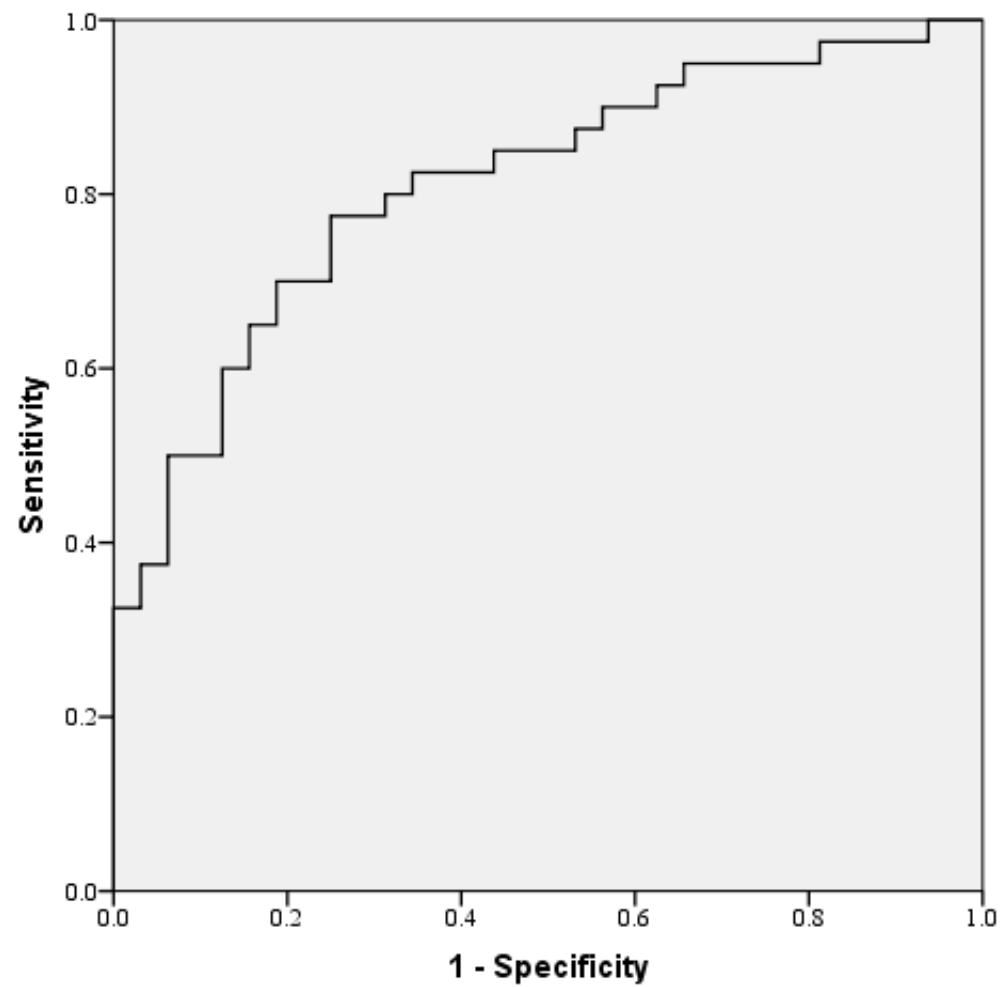


Figure 6. ROC curve for linear model excluding victim report.



## Appendix A.

## Intake Questionnaire

## MALE PACKET #1 FOR LAB STUDY #2

### Demographic & Background Questionnaire

- 1) Age: \_\_\_\_\_
- 2) Date of Birth: \_\_\_\_\_
- 3) Gender: Male    Female
- 4) Race:         a) African American                  b) Hispanic                  c) White                  d)  
Asian  
  
e) Native American    f) Other: (describe:\_\_\_\_\_)
- 5) What is your educational level: a) some High School    b) GED    c) High School graduate  
  
e) some college         f) AA or technical degree         g) college graduate (B.A., B.S.)
- 6) Do you currently have a job? a) Yes         b) No
- 6a) If yes, what do you do? What is your job title?: \_\_\_\_\_
- 6b) What kind of business do you work for?:\_\_\_\_\_
- 7) Do you work: a) Part-time         b) Full-time
- 8) What is your personal yearly income (before taxes)? \_\_\_\_\_
- 9) What is your spouse's/partner's yearly income (before taxes)? \_\_\_\_\_
- 10) Which best describes your total household income last year:
- |                              |                              |
|------------------------------|------------------------------|
| a. _____\$10,000 or less     | e. _____\$40,001 to \$60,000 |
| b. _____\$10,001 to \$20,000 | f. _____\$60,001 to \$80,000 |
| c. _____\$20,001 to \$30,000 | g. _____\$80,001 to 100,000  |
| d. _____\$30,001 to \$40,000 | h. _____\$100,001 or more    |
- 11) Are you currently taking any medications? a) Yes         b) No
- 12) If yes, please list:

13) Have you ever had a head injury resulting in the loss of consciousness? a) Yes

b) No

14) Have you ever sought medical treatment for a head injury? a) Yes b) No

15) Have you ever had a concussion? (“seen stars?” or “had your bells rung?”) a) Yes

b) No

16) How long have you been involved with your current partner? \_\_\_\_ Years

\_\_\_\_ Months

17) Marital Status: a) Single b) Living together c) Married

d) Divorced e) Widowed

18) Do you have any children? a) Yes b) No

19) If yes, how many children? \_\_\_\_\_

20) Have you ever been arrested on a domestic violence charge? a) Yes b) No

21) If yes, how many times? \_\_\_\_\_

22) Have you ever been arrested for something else? (a **non**-domestic violence charge) a)

Yes

b) No

23) If yes, how many times? \_\_\_\_\_

24) List charges: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

25) Have you ever been in prison/incarcerated? a) Yes b) No

26) If yes, how many times? \_\_\_\_\_

27) In total, how long have you spent in prison? \_\_\_\_\_ Years \_\_\_\_\_ Months

28) As an adult (age 18 or older) have you ever been physically aggressive with anyone

besides your current partner? a) Yes

b) No

29) If yes, check all that apply  
aggressive  
or violent towards this type of person

If checked, number of times physically

- |                                                 |                       |
|-------------------------------------------------|-----------------------|
| a) previous partner(s) _____                    | Number of times _____ |
| b) brothers _____                               | Number of times _____ |
| c) sisters _____                                | Number of times _____ |
| d) mother _____                                 | Number of times _____ |
| e) father _____                                 | Number of times _____ |
| f) male friends _____                           | Number of times _____ |
| g) female friends _____                         | Number of times _____ |
| h) male acquaintances _____                     | Number of times _____ |
| i) female acquaintances _____                   | Number of times _____ |
| j) male strangers _____                         | Number of times _____ |
| k) female strangers _____                       | Number of times _____ |
| l) co-workers or bosses _____                   | Number of times _____ |
| m) police officers _____                        | Number of times _____ |
| n) in military combat/in the line of duty _____ | Number of times _____ |

30) Before the age of 18, did you have legal troubles or delinquency problems with school officials? a) Yes b) No

31) Were you ever sentenced to a Juvenile Detention center (“Juvy”)? a) Yes  
b) No

#### Childhood History

1. Before age 17, did you ever see your mother hit or beat up your father? a) Yes  
b) No

1a) If yes, how many times:

|       |      |       |           |            |             |                    |    |
|-------|------|-------|-----------|------------|-------------|--------------------|----|
| Never | Once | Twice | 3-5 times | 6-10 times | 11-20 times | More than<br>times | 20 |
| 0     | 1    | 2     | 3         | 4          | 5           | 6                  |    |

2. Before age 17, did you ever see your father hit or beat up your mother? a) Yes  
b) No

2a) If yes, how many times:

|            |           |            |                |                 |                  |                         |    |
|------------|-----------|------------|----------------|-----------------|------------------|-------------------------|----|
| Never<br>0 | Once<br>1 | Twice<br>2 | 3-5 times<br>3 | 6-10 times<br>4 | 11-20 times<br>5 | More than<br>times<br>6 | 20 |
|------------|-----------|------------|----------------|-----------------|------------------|-------------------------|----|

3. Before age 17 did a parent, stepparent or foster parent ever:
4. Do something on purpose to you that left marks, gave you bruises or scratches, broken bones or teeth, or made you bleed? a) Yes b) No
5. Before age 17, how often IN THE WORST YEAR THAT YOU CAN REMEMBER were you hit by your parents or other adults?

|            |           |            |                |                 |                  |                         |    |
|------------|-----------|------------|----------------|-----------------|------------------|-------------------------|----|
| Never<br>0 | Once<br>1 | Twice<br>2 | 3-5 times<br>3 | 6-10 times<br>4 | 11-20 times<br>5 | More than<br>times<br>6 | 20 |
|------------|-----------|------------|----------------|-----------------|------------------|-------------------------|----|

6. Before you were 17, did a person at least 5 years older than you ever touch you in a sexual way, make you touch their sexual parts, or try to have sex with you? a) Yes b) No

### Psychotherapy History

1. Have you ever been in therapy or counseling of any kind? a) Yes b) No

2. If yes, check all that apply:

- ☐ therapy for personal problems (like depression, anxiety, or adjustment problems)
- ☐ couples' therapy/marital therapy (for relationship problems)
- ☐ domestic violence/battering intervention program/anger management
- ☐ AA/alcohol rehab
- ☐ drug rehab/chemical dependency
- ☐ spiritual/pastoral counseling
- ☐ inpatient hospitalization for psychiatric problem
- ☐ other: Please describe: \_\_\_\_\_

2. Are you currently in therapy or counseling? a) Yes b) No

- ☐ therapy for personal problems (like depression, anxiety, or adjustment problems)
- ☐ couples' therapy/marital therapy (for relationship problems)
- ☐ domestic violence/battering intervention program/anger management
- ☐ AA/alcohol rehab
- ☐ drug rehab/chemical dependency
- ☐ spiritual/pastoral counseling

\_\_\_\_other: Please describe: \_\_\_\_\_

3. If you are currently or have recently been in a domestic violence, battering intervention, or anger management program, please provide the following:

Name of Agency (for example,  
PIVOT/AVDA):\_\_\_\_\_

Phone number, if  
known:\_\_\_\_\_

Name of group  
leader:\_\_\_\_\_

Appendix B

The Personal and Relationships Profile

**PRP**

The following statements about you or the relationship between you and other people (such as your partner or members of your family). Please read each statement and decide how much you agree with it.

Please mark the booklet or answer sheet using this key:

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                                               |                            |                |             |                         |
|-------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 1. My relationship with my partner is the most important relationship I have. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 2. My parents made sure I went to school.                                     | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 3. I would give up almost anything for my partner.                            | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 4. My partner doesn't have enough sense to make important decisions.          | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 5. I often feel empty.                                                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 6. I often break things that belong to others on purpose.                     | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                           |                            |                |             |                         |
|-----------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 7. People usually like my partner.                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 8. I'd do almost anything to keep people from leaving me. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                                                           |                            |                |             |                         |
|-----------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 9. I can calm myself down when I am upset with my partner.                                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 10. Before I let myself get really mad at my partner, I think about what will happen if I lose my temper. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 11. My parents did not keep me clean.                                                                     | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 12. A woman who has been raped probably asked for it.                                                     | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 13. I have family members who would help me out if I had a problem.                                       | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 14. Men are more dishonest than women.                                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 15. My partner often nags me.                                                                             | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

# TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                 |                      |             |          |                   |
|-----------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 16. I rarely have anything to do with religious activities.     | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 17. My partner is basically a good person.                      | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 18. I am always courteous, even to people who are disagreeable. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                                                        |                      |             |          |                   |
|----------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 19. Sometimes I can't remember what happened the night before because of drinking.     | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 20. I can't bring myself to say nice things to my partner even when I'm thinking them. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 21. Since age 15, I have stolen or tried to steal something worth more than \$50.00.   | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 22. When I was a kid, I saw my mother or father kick, punch, or beat up their partner. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 23. I often feel resentful of women.                                                   | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 24. I can feel my blood rising when I start to get mad at my partner.                  | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

# TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                   |                            |                |             |                         |
|-------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 25. I lie to make myself look better.                             | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 26. I enjoy my day-to-day life.                                   | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 27. I try not to think about terrible things that happened to me. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 28. I usually wake up feeling pretty good.                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                                                                                                           |                            |                |             |                         |
|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 29. Since age 15, I have stolen money (from anyone, including family).                                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 30. When I was a kid, people (adults or kids) who were <u>not part of my family</u> pushed, shoved, or slapped me, or threw things at me. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 31. I make excuses when I've said something to my partner I shouldn't have.                                                               | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 32. Men treat women badly.                                                                                                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 33. My life is generally going well.                                                                                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                                           |                            |                |             |                         |
|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 34. A boy who is hit by another boy should hit back.                                                                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 35. My partner does things just to annoy me.                                                                                              | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 36. There have been occasions when I took advantage of someone.                                                                           | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 37. When I was a kid, people (adults or kids) who were <u>not part of my family</u> told me to hit back if someone hit me or insulted me. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 38. My relationships have big ups and downs.                                                                                              | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                                                             |                            |                |             |                         |
|---------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 39. Before I was 18, <u>an adult</u> in my family had sex with me (vaginal, anal, or oral). | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 40. Men irritate me a lot.                                                                  | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 41. Sometimes I have doubts that my relationship with my partner will last.                 | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 42. My partner and I disagree about what types of affection are okay in public.             | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                 |                            |                |             |                         |
|-----------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 43. Men respect women.                                          | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 44. My parents did not comfort me when I was upset.             | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 45. Women treat men badly.                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 46. I worry that I have a drug problem.                         | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 47. I don't think about how what I do will affect other people. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 48. I give up easily on difficult projects.                     | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                                         |                            |                |             |                         |
|-----------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 49. Marriage is forever.                                                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 50. I don't like my work or classes.                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 51. Once sex gets past a certain point, a man can't stop himself until he is satisfied. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                                               |                      |             |          |                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 52. No matter who I am talking to I am always a good listener.                                                                                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 53. I don't tell my partner when I disagree about important things.                                                                           | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 54. I have a right to know everything my partner does.                                                                                        | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 55. I can usually tell when I am about to lose my temper at my partner.                                                                       | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 56. When I was a teenager, I was hit a lot by my mother or father.                                                                            | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 57. Before I was 18, <u>another kid</u> in my family made me look at or touch their private parts (sex organs), or looked at or touched mine. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 58. Before I was 15, I stole or tried to steal something worth more than \$50.00.                                                             | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                               |                      |             |          |                   |
|-------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 59. It's all right to break the law as long as you don't get hurt.            | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 60. My father or mother told me to hit back if someone hit me or insulted me. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                    |                            |                |             |                         |
|--------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 61. I avoid anything that reminds me of terrible things that happened to me.                                       | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 62. I have never been irked when people expressed ideas very different from my own.                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 63. When I was a kid, I often saw <u>kids</u> who were <u>not in my family</u> get into fights and hit each other. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 64. I am generally in a good mood.                                                                                 | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 65. I can think of a situation when I would approve of a wife slapping a husband's face.                           | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 66. I am sometimes irritated by people who ask favors of me.                                                       | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 67. I spend time with friends who have been in trouble with the law.                                               | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 68. I have goals in life that I try to reach.                                                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                             |                            |                |             |                         |
|-----------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 69. I would feel betrayed if my partner was too busy to spend time with me. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 70. I often do things that are against the law.                             | 1=<br>Strongly             | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly          |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                           |                      |             |          |                   |
|-------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
|                                                                                           | Disagree             |             |          | Agree             |
| 71. I think good things will happen to me in the future.                                  | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 72. If a wife refuses to have sex, there are times when it may be okay to make her do it. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 73. When I am drinking I usually have five or more drinks at a time.                      | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 74. I would hate it if my partner confided in someone besides me.                         | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 75. I sometimes drink five or more drinks at a time, but only on weekends.                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 76. I have friends who have committed crimes.                                             | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 77. When a boy is growing up, it's important for him to have a few fist fights.           | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 78. There is nothing I can do to control my feelings when my partner hassles me.          | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                                                                                             |                      |             |          |                   |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 79. When I was a kid, I saw a member of my family who was <u>not</u> my mother or father, push, shove, slap, or throw something at someone. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                                            |                            |                |             |                         |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 80. Before I was 18, <u>an adult</u> in my family made me look at or touch their private parts (sex organs), or looked at or touched mine. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 81. I have thought seriously about ending my relationship with my partner.                                                                 | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 82. I am constantly looking for signs of danger.                                                                                           | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 83. I go back and forth between thinking my partner is perfect or terrible.                                                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 84. I can think of a situation when I would approve of a husband slapping a wife's face.                                                   | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 85. To get ahead, I have done some things which are not right.                                                                             | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 86. I am easily frustrated by women.                                                                                                       | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 87. My partner likes to make me mad.                                                                                                       | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 88. It is sometimes hard for me to go on with my work if I am not encouraged.                                                              | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                             |                            |                |             |                         |
|-----------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 89. I often do things that other people think are dangerous.                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 90. Caring for my partner means more than caring for myself.                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 91. I was spanked or hit a lot by my mother or father.                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 92. I recognize when I am beginning to get angry with my partner.           | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 93. My partner needs to remember that I am in charge.                       | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 94. My partner and I disagree about each other's irritating habits.         | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 95. When my partner says something mean, I usually say something mean back. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 96. It is usually my partner's fault when I get mad.                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 97. People often interrupt me when I'm trying to get things done.           | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 98. I am easily startled.                                                   | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

# TESTING THE UTILITY OF NEURAL NETWORK MODELS

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                                                                    |                            |                |             |                         |
|--------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 99. My partner and I disagree about whether it is okay to tell each other we disagree.                             | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 100. Before I was 18, <u>an adult who was not part of my family</u> had sex with me (vaginal, anal, oral).         | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 101. I sometimes drink enough to feel really high or drunk.                                                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 102. Since age 15, I have carried a hidden weapon other than a plain pocket knife (when not necessary for my job). | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 103. My partner and I generally have equal say about decisions.                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 104. My partner treats me well.                                                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 105. Women irritate me a lot.                                                                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 106. I don't have enough money for my daily needs.                                                                 | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 107. My partner and I disagree about his or her friends and family.                                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                |                            |                |             |                         |
|------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 108. My parents did not help me to do my best. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
|------------------------------------------------|----------------------------|----------------|-------------|-------------------------|

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                         |                            |                |             |                         |
|-------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 109. I'm always willing to admit it when I make a mistake.              | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 110. I can set up a time out break during an argument with my partner.  | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 111. I sometimes feel resentful when I don't get my way.                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 112. Men are rude.                                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 113. My relationship with my partner is worth the effort I put into it. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 114. I attend a church, synagogue, or mosque once a month or more.      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 115. A man should not walk away from a physical fight with another man. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 116. I have had thoughts of cutting or burning myself.                  | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                  |                      |             |          |                   |
|------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 117. In the past, I used coke, crack, or harder drugs (like uppers, heroin, or opiates) more than once or twice. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 118. My sex life with my partner is good.                                                                        | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree                                              |                      |             |          |                   |

|                                                                                                                                                                        |                      |             |          |                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 119. I get hassled because of who I am.                                                                                                                                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 120. My parents did not care if I got into trouble at school.                                                                                                          | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 121. I often get hurt by things that I do.                                                                                                                             | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 122. I have overdosed on drugs or had a severe health problem because of taking drugs to get high.                                                                     | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 123. Before I was 18, <u>another kid</u> who was <u>not part of my family</u> made me look at or touch their private parts (sex organs), or looked at or touched mine. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 124. When I feel myself getting angry at my partner, I try to tell myself to calm down.                                                                                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 125. It's sometimes necessary for parents to slap a teen who talks back or is getting into trouble.                                                                    | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                                                                     |                      |             |          |                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 126. I have a right to be involved in anything my partner does.                                                                                                     | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 127. I am so sad, sometimes I wonder why I bother to go on living.                                                                                                  | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 128. Before I was 18, <u>an adult</u> who was <u>not part of my family</u> made me look at or touch their private parts (sex organs), or looked at or touched mine. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree                                                                                                 |                      |             |          |                   |

|                                                                                                |                      |             |          |                   |
|------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 129. There have been times when I was quite jealous of the good fortune of others.             | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 130. Since age 15, I have physically attacked someone with the idea of seriously hurting them. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 131. Terrible things happened to me that made me feel helpless and horrified.                  | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 132. I would hate it if my partner paid a lot of attention to someone besides me.              | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 133. When I don't understand what my partner means I ask for more explanation.                 | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 134. I wish my partner and I got along better than we do.                                      | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                  |                      |             |          |                   |
|------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 135. When my partner and I have problems, I blame him or her.                                                    | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 136. My housing is not satisfactory (e.g., too much noise, heating problems, run-down, problems with neighbors). | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 137. I would be upset if my partner hugged someone a little too long.                                            | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 138. My partner and I disagree about when to have sex.                                                           | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                                                  |                      |             |          |                   |
|----------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 139. I share my thoughts with a family member.                                   | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 140. I sometimes try to get even rather than forgive and forget.                 | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 141. I feel sad quite often.                                                     | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 142. I'd feel jealous if my partner were helpful to someone of the opposite sex. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 143. Women are rude.                                                             | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

# TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                           |                      |             |          |                   |
|-----------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 144. When my partner is nice to me I wonder what my partner wants.                                        | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 145. I only treat people badly if they deserve it.                                                        | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 146. Before I was 18, <u>another kid</u> in my family did things to me that I now think was sexual abuse. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 147. When my partner wants to talk about our problems, I try to avoid talking about them.                 | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 148. I have trouble following the rules at work or school.                                                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                                                                                            |                      |             |          |                   |
|----------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 149. I often lie to get what I want.                                                                                       | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 150. Finding time for meals is hard for me.                                                                                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 151. There have been times when I have felt like rebelling against people in authority even though I knew they were right. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 152. I insist on knowing where my partner is at all times.                                                                 | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                                |                            |                |             |                         |
|----------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 153. My partner and I disagree about my friends and family.                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 154. When I'm mad at my partner, I say what I think without thinking about the consequences.                   | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 155. My parents gave me enough clothes to keep me warm.                                                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 156. My partner and I disagree about how much money to spend when we go places.                                | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 157. Before age 15, I carried a hidden weapon other than a plain pocket knife (when not necessary for my job). | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 158. I say mean things to my partner but then tell him or her "I'm only kidding".                              | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                                                                                                   |                            |                |             |                         |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 159. Before I was 18, <u>another kid</u> who was <u>not part of my family</u> did things to me that I now think was sexual abuse. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 160. On a few occasions, I have given up doing something because I have thought too little of my ability.                         | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 161. It is sometimes necessary to discipline a child with a good, hard spanking.                                                  | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                     |                            |                |             |                         |
|-------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 162. My mood is always changing.                                                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 163. My parents helped me with homework.                                            | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 164. My friends pressure me to do things I don't want to do.                        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 165. I change suddenly from being one kind of person to another.                    | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 166. Sometimes I have to remind my partner of who's boss.                           | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 167. There are more bad things than good things in my relationship with my partner. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 168. My partner and I disagree about how much time we should spend together.        | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

1= Strongly Disagree    2= Disagree    3=    4=Strongly Agree  
Agree

|                                                |                            |                |             |                         |
|------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 169. My parents helped me when I had problems. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 170. I have considered leaving my partner.     | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                            |                      |             |          |                   |
|--------------------------------------------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 171. Terrible things have happened to me that I remember over and over.                    | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 172. Before age 15, I physically attacked someone with the idea of seriously hurting them. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 173. I have never deliberately said something that hurt someone's feelings.                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 174. I've been terrified by things that have happened to me.                               | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 175. I've told others I will kill myself.                                                  | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 176. I would be upset if someone hugged my partner a little too long.                      | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 177. I would hate it if someone else paid a lot of attention to my partner.                | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 178. Before age 15, I stole money (from anyone, including family).                         | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

1= Strongly Disagree    2= Disagree    3= Agree    4=Strongly Agree

|                                                      |                      |             |          |                   |
|------------------------------------------------------|----------------------|-------------|----------|-------------------|
| 179. My partner and I have a very good relationship. | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |
| 180. I have a good social life with my partner.      | 1= Strongly Disagree | 2= Disagree | 3= Agree | 4= Strongly Agree |

TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                                                                | Disagree                   |                |             | Agree                   |
|------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------|-------------------------|
| 181. I feel sorry when I hurt someone.                                                         | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 182. I have thought about killing myself.                                                      | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 183. People at work or school don't get along with me.                                         | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 184. I have been treated for a drug problem.                                                   | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 185. My partner and I disagree about telling other people about things that happen between us. | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 186. I would be mad if my partner flirted with someone else.                                   | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |
| 187. I have bad dreams about terrible things that happened to me.                              | 1=<br>Strongly<br>Disagree | 2=<br>Disagree | 3=<br>Agree | 4=<br>Strongly<br>Agree |

Appendix C

The Danger Assessment

DA  
(Campbell)

| Please answer the following questions by circling yes or no. The <i>he</i> in the questions refers to your husband or partner.                                                                                                                                        |          |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------|
| 1. Has the physical violence increased in frequency during the past year?                                                                                                                                                                                             | Yes<br>1 | No<br>2 |
| 2. Has the physical violence increased in severity during the past year and/or has a weapon or threat with a weapon been used?                                                                                                                                        | Yes<br>1 | No<br>2 |
| 3. Does he ever try to choke you?                                                                                                                                                                                                                                     | Yes<br>1 | No<br>2 |
| 4. Is there a gun in the house?                                                                                                                                                                                                                                       | Yes<br>1 | No<br>2 |
| 5. Has he ever forced you into having sex when you did not wish to have sex?                                                                                                                                                                                          | Yes<br>1 | No<br>2 |
| 6. Does he use drugs?                                                                                                                                                                                                                                                 | Yes<br>1 | No<br>2 |
| 7. Does he threaten to kill you and/or do you believe he is capable of killing you?                                                                                                                                                                                   | Yes<br>1 | No<br>2 |
| 8. Is he drunk every day or almost every day?                                                                                                                                                                                                                         | Yes<br>1 | No<br>2 |
| 9. Does he control most or all of your daily activities? (For instance, does he tell you whom you can be friends with, how much money you can take with you shopping, or when you can take the car?)<br><b>(If he tries but you do not let him, check here ____.)</b> | Yes<br>1 | No<br>2 |
| 10. Have you ever been beaten by him while you were pregnant?<br><b>(If never pregnant by him, check here ____.)</b>                                                                                                                                                  | Yes<br>1 | No<br>2 |
| 11. Is he violently and constantly jealous of you? (For instance, does he say, "If I can't have you, no one can.")                                                                                                                                                    | Yes<br>1 | No<br>2 |

# TESTING THE UTILITY OF NEURAL NETWORK MODELS

|                                                          |              |         |
|----------------------------------------------------------|--------------|---------|
|                                                          |              |         |
| 12. Have you ever threatened or tried to commit suicide? | Yes<br>1     | No<br>2 |
| 13. Has he ever threatened or tried to commit suicide?   | Yes<br>1     | No<br>2 |
| 14. skip                                                 | Item omitted |         |
| 15. Is he violent outside the home?                      | Yes<br>1     | No<br>2 |

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