

# *Of Mice and Men*

## *Will the Intersection of Social Science and Genetics Create New Approaches for Intimate Partner Violence?*

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*The past two decades have yielded a recognition that intimate partner violence is ubiquitous. Although violence within relationships is bidirectional, there is acknowledgment that violence directed against women is more persistent and dangerous. Strategies for treatment of men have been largely unsuccessful, and studies of women-centered approaches to prevention are in their infancy. An emerging concept in the brain-behavior field is the recognition of genetics as a powerful influence on aggressive and violent behaviors. Mouse models of human health and disease have facilitated our understanding of the role of genetics in the manifestation of these traits. There is a need to push the boundaries of research on intimate partner violence by adopting biosocial approaches to understand its causes.*

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### **WHAT HAVE WE LEARNED ABOUT INTIMATE PARTNER VIOLENCE?**

The past 20 years in violence and trauma research have uncovered the ubiquitous nature of intimate partner violence in cultures throughout the world. This, in turn, has sparked a frenzy of measurement strategies in research-

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intense environments. A plethora of tools have been developed, including the Abuse Assessment Screen (Parker & McFarlane, 1991), the Abusive Behavior Inventory (Shepard & Campbell, 1992), Attitudes to Wife Abuse Scale (Briere, 1987), Index of Spouse Abuse (Hudson & McIntosh, 1981), Inventory of Beliefs About Wife Beating (Saunders, Lynch, Grayson, & Linz, 1987), Psychological Maltreatment of Women Inventory (Tolman, 1989), Revised Conflict Tactics Scale(s) (Straus, Hamby, Boney-McCoy, & Sugarman, 1996), and Severity of Violence Against Women Scale (Marshall, 1992). As well, varying frameworks for measuring violence have evolved, including time (lifetime, previous year, current, during pregnancy), relationship to the perpetrator (previous or current, husband, same sex partner), nature of violence (physical, verbal, emotional, financial, sexual), degree of violence (low impact, moderate, severe), and consequence of violence (visits to emergency departments, Post-Traumatic Stress Disorder, chronic physical and mental health problems, suicide, and homicide).

The prevalence of exposure to intimate partner violence throughout the lifetime has most often been estimated at 25% in the United States (Straus & Gelles, 1986; Tjaden & Thoennes, 2000) and Canada (Johnson, 1998). Whereas clinic and hospital-based studies have quoted a wide range of prevalence rates, large population-based studies have consistently recorded prior year rates at 1% to 4% (Canadian Centre for Justice Statistics, 2000; Mirrlees-Black, 1999; Tjaden & Thoennes, 2000) and prior 5-year rates at 7% (Canadian Centre for Justice Statistics, 2000). Most commonly, intimate partner violence involves pushing, shoving, and slapping, but 10% of women surveyed have been choked, beaten, sexually assaulted, or attacked with a weapon (Johnson, 1998). In fact, women in North America are more likely to be assaulted by an intimate partner than by anyone else (Browne & Williams, 1993; Campbell et al., 2003; Kellerman & Mercy, 1992; Wilson & Daly, 1994). Women in Canada are nine times more likely to be murdered by a male partner than a stranger (Wilson & Daly, 1994).

Adding to the pervasive nature of abuse of women by intimate partners is the reality that leaving the relationship often does little to reduce risk. In fact, women's efforts to end the relationship often are met with escalating violence (Coleman, 1997; LaViolette & Barnett, 2000). Women with abusive partners are at substantial risk for harassment and stalking following the dissolution of an abusive relationship (Mechanic, Weaver, & Resick, 2000; Tjaden & Thoennes, 2000). Moreover, some women experience their first abusive episode after separation (Fleury, Sullivan, & Bybee, 2000; Kurcz, 1996). Of particular concern, lethal violence is reportedly highest following separation (Campbell, 1992; Coleman, 1997; McFarlane, Campbell, Wilt, Sachs, Ulrich, & Xu, 1999; Meloy, 1998). Finally, most authors agree that victims of

abuse in intimate relationships and stalking experience diverse and serious psychological, physical, and financial effects (Pathe & Mullen, 1997).

In the past 5 years, attention has turned from measurement of violence as largely a women's issue to consideration of both sexes, with the subsequent understanding that violence is often bidirectional in a relationship (Archer, 2000, 2002; Cook, 1998; Straus, 1999). The consequences of violence, however, remain clearly related to the sex of perpetrators/victims, with women more often suffering grievous harm at the hands of male perpetrators (Campbell, 1986; Straus, 1999; Tjaden & Thoennes, 2000). In their review of the literature, Nicholls and Dutton (2001) asserted that a minority of women (estimated at 8-12%; Dutton, 1998b) experience extreme, repetitive, and systematic abuse to which men are unlikely to be exposed (Jasinski & Williams, 1998). There is little evidence to suggest that men face the same threat when attempting to end an abusive relationship. Women make up the vast majority of stalking victims with reported lifetime prevalence of 8.1% among women versus 2.2% among men (Tjaden & Thoennes, 2000). Of note, intimate stalkers appear to pose a greater threat to their targets than nonintimate stalkers (Palarea, Zona, Lane, & Langhinrichsen-Rohling, 1999).

#### **WHAT DO WE NEED TO LEARN ABOUT INTIMATE PARTNER VIOLENCE IN THE NEXT 10 YEARS?**

In light of prevalence data and evidence of harm resulting from male perpetrated intimate partner violence, considerable efforts have been made to reduce rates of violence against women. Many jurisdictions in North America have implemented mandatory arrest policies, probation, and treatment programs. Babcock and Steiner (1999) estimated that more than 84% of large U.S. municipalities have adopted mandatory arrest policies. Kropp and Hart (2000) reported that implementation of criminal justice sanctions and treatment has resulted in assaults by intimate partners representing more than 80% of all violent crimes reported to the police. Unfortunately, empirical evidence demonstrating the efficacy of interventions with abusers is lacking. Temporary civil protection orders have been associated with an increase in psychological abuse of women (Holt, Kernic, Lumley, Wolf, & Rivara, 2002). Arrest has been found to be a deterrent among men who have an investment in social conformity (for instance, employed batterers) but actually has been found to increase risk among unemployed perpetrators (Babcock & Steiner, 1999; Pate & Hamilton, 1992; Sherman et al., 1992). Babcock and Steiner (1999) reported that incarceration in lieu of treatment was related to an increase in recidivism.

Treatment programs for abusive males in the health sector have had minimal effects on recidivism (Rosenfeld, 1992). The first formal meta-analysis of treatment outcome studies demonstrated very small effect sizes for interventions with male batterers (Babcock, Green, & Robie, 2004). Kropp and Hart (2000) recently concluded that perpetrators, even those who have participated in treatment, have the highest rate of recidivism of all violent offenders. In fact, some studies suggest that treatment programs of abusers may increase women's risk, given that a man's participation in treatment often is stated as a reason for returning to the abuser (Gondolf, 1988) or for offering a false sense of security (Babcock & Steiner, 1999). Babcock et al. (2004) concluded that a man who was arrested, charged, and enrolled in a batterers' program had a 5% reduction in his risk for recidivating.

The issue of heterogeneity of abusers may provide insight into the lack of effectiveness of treatment programs. Recent work has begun to suggest that there is not a unitary batterer profile (Hamberger & Hastings, 1986; Huss & Langhinrichsen-Rohling, 2000; Saunders, 1993). Personality characteristics/pathologies described include avoidant/dependent, borderline, and antisocial/psychopathic (see Dutton, 1998a, and Huss & Langhinrichsen-Rohling, 2000, for reviews). Along with these three distinct personality types are three fairly distinct patterns of abuse, ranging from violence that is primarily intimate to violence that is more general. These abuse patterns may have important implications for the assessment of risk for spousal assault (Kropp, Hart, Webster, & Eaves, 1995) as well as for informing treatment. Understanding of subgroups of batterers should inform the development of specific treatment interventions (Dutton, Bodnarchuk, Kropp, Hart, & Ogloff, 1997).

The past 10 years have seen the emergence of risk assessment tools with a view to secondary and tertiary prevention of violence, for example, the Propensity for Abusiveness Scale (Dutton, 1995), the Danger Assessment Scale (Campbell, 1995), and Spousal Assault Risk Assessment Guide (Kropp & Hart, 2000). Routine inquiry about exposure to intimate partner violence and risk assessment is predicated on a belief that appropriate interventions can be applied to prevent or reduce the sequelae of violence. A recent review concludes, "Few studies provide data on detection and management to guide clinicians. As a result, clinicians confront difficulties in fulfilling their role in prevention and treatment of the adverse health effects of violence" (Nelson, Nygren, McInerney, & Klein, 2004, p. 394). Although early studies of safety planning with women show promise with respect to enhancing safety, they still do not address the propensity of the abuser to seek new victims (McFarlane et al., 2002; McFarlane, Soeken, & Wiist, 2000).

Despite several decades of research on men's violence and evaluations of intervention programs, little is known about the factors and processes that

lead to desistance from violent behavior (Haggard, Gumpert, & Grann, 2001; Stefanakis, 1998).

#### **PROMISING METHODOLOGICAL INNOVATIONS: A GENETIC PERSPECTIVE**

A growing body of evidence suggests that genetic factors may contribute to human violence and aggression. For instance, twin and adoption studies demonstrate a strong genetic influence on the Aggressive Behavior Syndrome (AGG), one of the most universally identified and statistically robust syndromes of childhood behavior (Edelbrock, Rende, Plomin, & Thompson, 1995). Other genetic studies of human aggression have concerned traits inferred from personality tests, focusing on impulsive or antisocial personality traits, which are frequently associated with aggression (Carey, 1994). However, by far the clearest example of the role of genetics in humans is that of the brain enzyme, monoamine oxidase A (MAOA), which has been associated with abnormal social behavior, including impulsive aggression, attempted rape, arson, and exhibitionism (Brunner, Nelen, Breakefield, Ropers, & van Oost, 1993). More recently, the same gene has been implicated in adolescent conduct disorder and adult violent crime, providing compelling genetic and epidemiological evidence for a protective role of the MAOA gene in children exposed to physical and/or sexual abuse (Caspi et al., 2002). The study offers a novel explanation as to why some victims of childhood abuse do not themselves grow up to become abusers, thus shedding new light on the cycle of violence hypothesis (Kumar, 2003). A relationship between specific variants of the MAOA gene and persistent, pervasive childhood aggression has also been established (Beitchman, Mik, Ehtesham, Douglas, & Kennedy, 2004). Over the next decade and beyond, there is a need to push further the boundaries of genetic research by investigating novel candidate genes and molecular pathways that may underlie the predisposition to human violence. Equally important is an examination of gene-environment interaction and its role in the etiology and modulation of aggression and violence (Cadoret, Yates, Troughton, Woodworth, & Stewart, 1995; Tires, 2002).

#### **Modeling Human Violence Using Mice**

Discoveries using animal models are beginning to illuminate the role of biology in the development and pathogenesis of abnormal behavior, including violence and aggression (Koolhaas & Bohus, 1991). Notably, the genera-

tion of numerous "hyperaggressive" mutant mouse strains highlights the remarkable diversity of genes that may be involved in the genetic predisposition of these traits (Hen, 1996; Nelson & Chiavegatto, 2000). Although we are cognizant that no animal species can serve as an exact model for human aggression or violence, the high degree of genetic and developmental similarities between mice and humans, together with the ability to modify the genome (i.e., genetic makeup) of the mouse, make the mouse model a powerful tool with which to explore new candidate molecules that may mediate human violence. Indeed, disruption of the MAOA gene in mice causes increased aggression in this species, as it does in humans. Of particular interest is the "fierce" mouse that lacks the entire brain-specific Nr2e1 gene (Kumar et al., 2004). Such mice are exceedingly aggressive, and males will bite, wound, and ultimately kill their siblings or intended mate (Young et al., 2002). Unlike most genetic mouse models of aggression, in which males are typically the aggressor, the manifestation of aggression in both sexes of fierce mice permits an investigation into the genetic basis of female violence as well. Based on the knowledge that the mouse and human NR2E1 genes are functionally equivalent (B. S. Abrahams & E. M. Simpson, personal communication), we hypothesize that a subset of humans with violent predispositions will harbor mutations in their NR2E1 gene.

The significance of discoveries in the mouse genetics laboratory rests in the ability to draw parallels between what we know from mice and what is true for human brain-behavior disorders. The ability to control and modify both the genetics and environment of the mouse will enable the testing of novel biosocial hypotheses, tests that are not possible in humans. Bearing in mind the need to assess formally the potential socioethical issues that will arise from research in this field, genetic discoveries may inform novel assessment strategies, such as the early detection of at-risk individuals and early intervention with this population. The deciphering of the biological pathways that predispose to violence will identify key molecules that participate in the regulation of violent behavior, and this will ultimately give rise to the design of novel therapeutics that may alleviate the symptoms or causes of human violence or aggression.

Innovation in the study or treatment of intimate partner violence will emerge in the context of multidisciplinary and multilevel (molecular, individual, community) approaches. As we have valued the contribution of historians who have helped to illustrate the socially embedded nature of violence in our communities, of epidemiologists who have addressed the prevalence of the problem, of social scientists who have obliged us to understand the social costs of violence, and of clinicians who have begun to test interventions, new opportunities will be illuminated by even more diverse disciplines.

The question of the genetic origins of violence is provocative. Understanding the intersection of the molecular basis of violence and the ability to modify behavior through environmental strategies may be our best hope for the future.

## REFERENCES

- Archer, J. (2000). Sex differences in aggression between heterosexual partners: A meta-analytic review. *Psychological Bulletin*, *126*, 651-680.
- Archer, J. (2002). Sex differences in aggressive acts between heterosexual partners: A meta-analytic review. *Aggression & Violent Behavior*, *7*, 313-351.
- Babcock, J. C., Green, C. E., & Robie, C. (2004). Does batterers' treatment work?: A meta-analytic review of domestic violence treatment. *Clinical Psychology Review*, *23*, 1023-1053.
- Babcock, J. C., & Steiner, R. (1999). The relationship between treatment, incarceration, and recidivism of battering: A program evaluation of Seattle's coordinated community response to domestic violence. *Journal of Family Psychology*, *13*, 46-59.
- Beitchman, J. H., Mik, H. M., Ehtesham, S., Douglas, L., & Kennedy, J. L. (2004). MAOA and persistent, pervasive childhood aggression. *Molecular Psychiatry*, *9*(6), 546-547.
- Briere, J. (1987). Predicting self-reported likelihood of battering: Attitudes and childhood experiences. *Journal of Research in Personality*, *21*, 61-69.
- Browne, A., & Williams, K. R. (1993). Gender, intimacy, and lethal violence: Trends from 1976 through 1987. *Gender & Society*, *7*, 78-98.
- Brunner, H. G., Nelen, M., Breakefield, X. O., Ropers, H. H., & van Oost, B. A. (1993). Abnormal behavior associated with a point mutation in the structural gene for monoamine oxidase A. *Science*, *262*, 578-580.
- Cadoret, R. J., Yates, W. R., Troughton, E., Woodworth, G., & Stewart, M. A. (1995). Genetic-environmental interaction in the genesis of aggressivity and conduct disorders. *Archives of General Psychiatry*, *52*, 916-924.
- Campbell, J. (1986). Nursing assessment for risk of homicide with battered women. *Advances in Nursing Science*, *8*(4), 36-51.
- Campbell, J. C. (1992). A review of nursing research on battering. In C. M. Sampselle (Ed.), *Violence against women: Nursing research, education, and practice issues* (pp. 69-81). Washington, DC: Hemisphere.
- Campbell, J. C. (1995). Prediction of homicide of and by battered women. In J. C. Campbell (Ed.), *Assessing dangerousness. Violence by sexual offenders, batterers, and child abusers* (pp. 96-113). Thousand Oaks, CA: Sage.
- Campbell, J. C., Webster, D., Koziol-McLain, J., et al. (2003). Risk factors for femicide in abusive relationships: Results from a multisite case control study. *American Journal of Public Health*, *93*, 1089-1097.
- Canadian Centre for Justice Statistics. (2000). *Family violence in Canada: A statistical profile 2000*. Statistics Canada, Catalogue No. 85-224-XIE.
- Carey, G. (1994). Genetics of violence. In A. J. Reiss, K. A. Miczek, & J. A. Roth (Eds.), *Understanding and preventing violence: Volume 2, Biobehavioral influences. Report of the Panel on the Understanding and Control of Violent Behavior; Committee on Law and Justice, Commission on Behavioral and Social Sciences and Education, National Research Council* (pp. 21-58). Washington, DC: National Academy Press.

- Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., et al. (2002). Role of genotype in the cycle of violence in maltreated children. *Science, 297*, 851-854.
- Coleman, F. L. (1997). Stalking behavior and the cycle of domestic violence. *Journal of Interpersonal Violence, 12*, 420-432.
- Cook, P. W. (1998). *Abused men: The hidden side of domestic violence*. Westport, CT: Praeger.
- Dutton, D. G. (1995). A scale for measuring the propensity for abusiveness. *Journal of Family Violence, 10*, 203-221.
- Dutton, D. G. (1998a). *The abusive personality: Violence and control in intimate relationships*. New York: Guilford Press.
- Dutton, D. G. (1998b). *The domestic assault of women: Psychological and criminal perspectives*. Vancouver, BC: UBC Press.
- Dutton, D. G., Bodnarchuk, M., Kropp, R., Hart, S. D., & Ogloff, J. (1997). Client personality disorders affecting wife assault post treatment recidivism. *Violence and Victims, 12*(1), 37-50.
- Edelbrock, C., Rende, R., Plomin, R., & Thompson, L. A. (1995). A twin study of competence and problem behavior in childhood and early adolescence. *Journal of Child Psychology and Psychiatry, 36*, 775-785.
- Fleury, R. E., Sullivan, C. M., & Bybee, D. I. (2000). When ending the relationship does not end the violence: Women's experiences of violence by former partners. *Violence Against Women, 6*, 1363-1383.
- Gondolf, E. W. (1988). The state of the debate: A review essay on woman battering. *Victimization of Women & Children, 11*, 3-8.
- Haggard, U., Gumpert, C., & Grann, M. (2001). Against all odds: A qualitative follow-up study of high risk violent offenders who were not reconvicted. *Journal of Interpersonal Violence, 16*(10), 1048-1065.
- Hamberger, L. K., & Hastings, J. E. (1986). Personality correlates of men who abuse their partners: A cross-validation study. *Violence and Victims, 1*, 323-341.
- Hen, R. (1996). Mean genes. *Neuron, 16*, 17-21.
- Holt, H., Kernic, M., Lumley, T., Wolf, M., & Rivara, F. (2002). Civil protection orders and risk of subsequent police-reported violence. *Journal of the American Medical Association, 288*(5), 589-594.
- Hudson, W. W., & McIntosh, S. R. (1981). The assessment of spouse abuse: Two quantifiable dimensions. *Journal of Marriage and the Family, 43*, 873-885.
- Huss, M. T., & Langhinrichsen-Rohling, J. (2000). Identification of the psychopathic batterer: The clinical, legal, and policy implications. *The Review Journal: Aggression and Violent Behavior, 5*(4), 403-422.
- Jasinski, J. L., & Williams, L. M. (Eds.). (1998). *Partner violence: A comprehensive review of 20 years of research*. Thousand Oaks, CA: Sage.
- Johnson, H. (1998). Rethinking survey research on violence against women. In R. E. Dobash & R. P. Dobash (Eds.), *Rethinking violence against women* (pp. 23-50). Thousand Oaks, CA: Sage.
- Kellerman, A. L., & Mercy, J. A. (1992). Men, women, and murder: Gender-specific difference in rates of fatal violence and victimization. *Journal of Trauma, 33*, 1-2.
- Koolhaas, J. M., & Bohus, B. (1991). Animal models of human aggression. In A. Boulton, G. Baker, & M. Martin-Iverson (Eds.), *Neuromethods, Vol. 19: Animal models in psychiatry, II* (pp. 249-271). Clifton, NJ: The Humana Press.
- Kropp, P. R., & Hart, S. D. (2000). The Spousal Assault Risk Assessment (SARA) Guide: Reliability and validity. *Law & Human Behavior, 24*, 101-118.

- Kropp, P. R., Hart, S. D., Webster, C. D., & Eaves, D. (1995). *Manual for the Spousal Assault Risk Assessment Guide* (2nd ed.). Vancouver, BC: The British Columbia Institute Against Family Violence.
- Kumar, R. A. (2003). Violence begets violence, or does it? A brain enzyme protects victims of childhood abuse from becoming antisocial and criminal. *Clinical Genetics*, *63*(3), 180-183.
- Kumar, R. A., Chan, K. L., Wong, A. H., Little, K. Q., Rajcan-Separovic, E., Abrahams, B., et al. (2004). Unexpected embryonic stem (ES) cell mutations represent a concern in gene targeting: Lessons from "fierce" mice. *Genesis*, *38*, 51-57.
- Kurcz, D. (1996). Separation, divorce, and woman abuse. *Violence Against Women*, *2*, 63-81.
- LaViolette, A. D., & Barnett, O. W. (2000). *It could happen to anyone: Why battered women stay* (2nd ed.). Thousand Oaks, CA: Sage.
- Marshall, L. (1992). Development of the severity of violence against women scales. *Journal of Family Violence*, *7*, 103-121.
- McFarlane, J., Malecha, A., Gist, J., Watson, K., Batten, E., Hall, I., & Smith, S. (2002). An intervention to increase safety behaviors of abused women. *Nursing Research*, *51*(6), 347-354.
- McFarlane, J., Soeken, K., & Wiist, W. (2000). An evaluation of interventions to decrease intimate partner violence to pregnant women. *Public Health Nursing*, *17*(6), 443-451.
- McFarlane, J. M., Campbell, J. C., Wilt, S., Sachs, C. J., Ulrich, Y., & Xu, X. (1999). Stalking and intimate partner femicide. *Homicide Studies: An Interdisciplinary & International Journal*, *3*, 300-316.
- Mechanic, M. B., Weaver, T. L., & Resick, P. A. (2000). Intimate partner violence and stalking behavior: Exploration of patterns and correlates in a sample of acutely battered women. *Violence and Victims*, *15*, 55-72.
- Meloy, J. R. (1998). *The psychology of stalking: Clinical and forensic perspectives*. San Diego: Academic Press.
- Mirrlees-Black, C. (1999). *Domestic violence: Findings from a new British crime survey self-completion questionnaire*. London: Home Office.
- Nelson, H., Nygren, P., McInerney, Y., & Klein, J. (2004). Screening women and elderly adults for family and intimate partner violence: A review of the evidence for the U.S. Preventive Services Task Force. *Annals of Internal Medicine*, *140*, 387-396.
- Nelson, R. J., & Chiavegatto, S. (2000). Aggression in knockout mice. *Institute for Laboratory Animal Research Journal*, *41*, 153-162.
- Nicholls, T. L., & Dutton, D. G. (2001). Abuse committed by women against male intimates. *Journal of Couples Therapy*, *10*, 41-57.
- Palarea, R. E., Zona, M. A., Lane, J. C., & Langhinrichsen-Rohling, J. (1999). The dangerous nature of intimate relationship stalking: Threats, violence, and associated risk factors. *Behavioral Sciences & the Law*, *17*, 269-283.
- Parker, B., & McFarlane, J. (1991). Nursing assessment of the battered pregnant woman. *American Journal of Maternal Child Nursing*, *16*(3), 161-164.
- Pate, A., & Hamilton, E. (1992). Formal and informal deterrents to domestic violence: The Dade County spouse assault experiment. *American Sociological Review*, *57*, 691-697.
- Pathe, M., & Mullen, P. (1997). The impact of stalkers on their victims. *British Journal of Psychiatry*, *170*, 12-17.
- Rosenfeld, B. (1992). Court-ordered treatment of spouse abuse. *Clinical Psychology Review*, *12*, 205-226.
- Saunders, D. G. (1993). Husbands who assault: Multiple profiles requiring multiple responses. In N. Z. Hilton (Ed.), *Legal responses to wife assault* (pp. 9-34). Newbury Park, CA: Sage.

- Saunders, D. G., Lynch, A. B., Grayson, M., & Linz, D. (1987). The inventory of beliefs about wife beating: The construction and initial validation of a measure of beliefs and attitudes. *Violence and Victims, 2*, 39-57.
- Shepard, M., & Campbell, J. (1992). The abusive behavior inventory: A measure of psychological and physical abuse. *Journal of Interpersonal Violence, 4*, 291-305.
- Sherman, L. W., Schmidt, J. D., Rogan, D. P., Smith, D. A., Gartin, P. R., Cohn, E. G., et al. (1992). The variable effects of arrest on criminal careers: The Milwaukee domestic violence experiment. *Journal of Criminal Law & Criminology, 83*, 137-169.
- Stefanakis, H. (1998). *Desistence from violence: Men's stories of identity transformations*. Unpublished doctoral dissertation, University of Guelph, Ontario.
- Straus, M., & Gelles, R. J. (1986). Societal change and change in family violence from 1975 to 1985 as revealed by two national surveys. *Journal of Marriage & the Family, 48*, 465-479.
- Straus, M. A. (1999). The controversy over domestic violence by women: A methodological, theoretical, and sociology of science analysis. In X. B. Arriaga & S. Oskamp (Eds.), *Violence in intimate relationships* (pp. 17-44). Thousand Oaks, CA: Sage.
- Straus, M. A., Hamby, S. L., Boney-McCoy, S., & Sugarman, D. B. (1996). The revised Conflict Tactics Scale (CTS2): Development and preliminary psychometric data. *Journal of Family Issues, 17*, 283-316.
- Tiret, L. (2002). Gene-environment interaction: A central concept in multifactorial diseases. *Proceedings of the Nutrition Society, 61*, 457-463.
- Tjaden, P., & Thoennes, N. (2000). Prevalence and consequences of male-to-female and female-to-male intimate partner violence as measured by the National Violence Against Women Survey. *Violence Against Women, 6*, 142-161.
- Tolman, R. M. (1989). The development of a measure of psychological maltreatment of women by their male partners. *Violence and Victims, 4*, 159-177.
- Wilson, M. I., & Daly, J. (1994). Spousal homicide. *Statistics Canada, 14*, 1-15.
- Young, K. A., Berry, M. L., Mahaffey, C. L., Saionz, J. R., Hawes, N. L., Chang, B., et al. (2002). Fierce: A new mouse deletion of Nr2e1; violent behaviour and ocular abnormalities are background-dependent. *Behavior and Brain Research, 132*, 145-158.

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