Psychosocial Intervention

Psychosocial Intervention
ISSN: 1132-0559
ISSN: 2173-4712
Colegio Oficial de la Psicología de Madrid

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Psychosocial Intervention, vol. 28, no. 3, 2019, pp. 157-167
Colegio Oficial de la Psicología de Madrid

DOI: https://doi.org/10.5093/pi2019a19

Available in: http://www.redalyc.org/articulo.oa?id=179862157006

Psychosocial Intervention (2019) 28(3) 157-167

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https://journals.copmadrid.org/pi

Identifying Key Predictors of Recidivism among Offenders Attending a Batterer Intervention Program: A Survival Analysis

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ARTICLE INFO

Article history:
Received 25 February 2019
Accepted 23 May 2019

Keywords:
Intimate partner violence
Offenders
Batterer intervention programs
Recidivism
Predictors

A B S T R A C T

Strategies to reduce intimate partner violence against women (IPVAW) can be targeted at different levels. Batterer intervention programs (BIPs) are among the main treatment approaches for IPVAW offenders. The most common outcome used in the evaluation of BIP effectiveness is recidivism. Efforts to increase BIP effectiveness in reducing recidivism should focus on key predictive variables of this outcome. The aim of this study was to identify key predictors of official recidivism from a large set of variables drawn from a sample of IPVAW offenders court-mandated to a community-based BIP (N = 393), with a follow-up period of between 0 and 69 months. To this end, a survival analysis was conducted using four sets of variables: individual-level, relational- and contextual-level, violence-related, and intervention process-related variables. To include all variables in the analysis simultaneously, a Cox regression model was estimated with the adaptive least absolute shrinkage and selection operator (ALASSO). From a pool of eighty-nine variables, six were selected as key predictors of recidivism: dropout, risk of future violence against non-partners, family violence exposure, immigrant status, accumulation of stressful life events, and trait anger. The area under the receiving operator characteristic (ROC) curve was .808, indicating good prediction of the model. The key predictors of recidivism found in this study should be considered by professionals and researchers in the BIP field to improve their evaluation and intervention strategies. Practical implications for future research are also discussed.

Los predictores clave de la reincidencia en participantes en un programa de intervención para agresores de pareja: un análisis de supervivencia

Palabras clave:
Violencia de pareja contra la mujer
Agresores
Programas de intervención con agresores de pareja
Reincidencia
Predictores

R E S U M E N

Las estrategias para reducir la violencia contra la mujer en las relaciones de pareja pueden dirigirse a diferentes objetivos. Los programas de intervención para agresores de pareja son uno de los principales acercamientos para su tratamiento. El resultado más utilizado para la evaluación de la efectividad de estos programas es la reincidencia. Los esfuerzos para incrementar la efectividad de los programas de intervención para agresores de pareja en reducir la reincidencia deberían centrarse en las variables predictoras clave de este resultado. El objetivo de este estudio fue identificar los predictores clave de la reincidencia oficial a partir de un amplio conjunto de variables obtenidas a partir de una muestra de hombres participando por mandato judicial en un programa de intervención para agresores de pareja (N = 393), con un periodo de seguimiento de entre 0 y 69 meses. Con este objetivo, se realizó un análisis de supervivencia utilizando cuatro conjuntos de variables: variables individuales, variables relacionales y contextuales, variables relativas a la violencia y variables relativas al proceso de intervención. Para incluir simultáneamente todas las variables en el análisis, se estimó un modelo de regresión de Cox utilizando ALASSO (*adaptive least absolute shrinkage and selection operator*). De un conjunto de ochenta y nueve variables, seis fueron seleccionadas como predictores clave: abandono del programa, riesgo de violencia futura contra otras personas, exposición a violencia familiar, estatus de inmigrante, acumulación de eventos vitales estresantes e ira rasgo. El área bajo la curva ROC (*receiving operator characteristic*) fue .808, indicando una buena predicción del modelo. Los predictores clave de la reincidencia identificados en este estudio deberían ser considerados por los profesionales e investigadores en el ámbito de la intervención con agresores de pareja para mejorar sus estrategias de evaluación e intervención. Asimismo, se discuten las implicaciones prácticas para futuras investigaciones.

Cite this article as: Lila, M., Martín-Fernández, M., Gracia, E., López-Ossorio, J. J., & González, J.L. (2019). Identifying key predictors of recidivism among offenders attending a batterer intervention program: A survival analysis. *Psychosocial Intervention, 28,* 157-167. https://doi.org/10.5093/pi2019a19

Funding: This research was supported by the Spanish Ministry for Health, Consumer Affairs and Social Welfare's National Drug Plan (PND2018/021) and the University of Valencia (UV-INV-AE18-779244). Manuel Martín-Fernández was supported by the FPI program of the Spanish Ministry of Economy and Competitiveness (BES-2015-075576).
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Intimate partner violence against women (IPVAW) is a social and public health problem worldwide (Devries et al., 2013; García-Moreno, Jansen, Ellsberg, Heise, & Watts, 2006; Stöckl et al., 2013). A World Health Organization (2013) study estimated that 30% of women around the world had suffered physical and/or sexual violence from their partners or ex-partners at some point in their lives. The physical, psychological, and social consequences of this type of violence on women victims, their families, and the wider community have been widely acknowledged (Campbell, 2002; Craparo, Gori, Petruccelli, Cannella, & Simonelli, 2014; Ellsberg, Jansen, Heise, Watts, & Garcia-Moreno, 2008; Guedes, Bott, Garcia-Moreno, & Colombini, 2016; Vilariño, Amado, Vázquez, & Arce, 2018). Thus, IPVAW is a major concern among researchers, professionals, and public administrations, who increasingly call for more effective strategies to prevent it and reduce its prevalence (Ellsberg et al., 2015; García-Moreno et al., 2015; Heise, 2011).

Strategies to reduce IPVAW can be targeted at different levels, including treatment for abusers (World Health Organization, 2002). Batterer intervention programs (BIPs) are among the main treatment approaches for IPVAW offenders (Cannon, Hamel, Buttell, & Ferriera, 2016; Voith, Logan-Greene, Strodthoff, & Bender, 2018). In many countries, men with an intimate partner violence-related conviction are court-mandated to a BIP (Cannon et al., 2016; Hamilton, Koehler, & Lösel, 2013; Mackay, Gibson, Lam, & Beecham, 2015). These programs aim to change men's attitudes, cognitions, and behaviors related to IPVAW (Babcock, Graham, Canady, & Ross, 2011; Pence & Paymar, 1993; Wexler, 2000), and share the broad aim of reducing offender recidivism (Babcock, Green, & Robie, 2004; Bowen, 2011; Eckhardt et al., 2013). Thus, recidivism is the most common outcome used in the evaluation of BIP effectiveness (Bowen, 2011; Scott, 2004).

To date, a substantial number of studies and meta-analyses have assessed BIP effectiveness in reducing recidivism (e.g., Arias, Arce, & Vilariño, 2013; Babcock et al., 2004; Eckhardt et al., 2013; Feder & Wilson, 2005; Nesset et al., 2019; Smedslund, Dalsbø, Steiro, Winsvold, & Clench-Aas, 2011). However, most of these studies concluded that more evidence is needed to support the effectiveness of BIPs in reducing recidivism rates. Therefore, there is a wide agreement among scholars in this research field on the need to improve BIPs in order to increase their effectiveness (Babcock et al., 2016; Levesque, Ciavatta, Castle, Prochaska, & Prochaska, 2012; Lila, Gracia, & Catalá-Miñana, 2018; Murphy & Ting, 2010). One strategy to improve BIP effectiveness would be to properly identify and target the key variables associated with IPVAW offender recidivism.

Research has analyzed a wide number of variables associated with IPVAW offender recidivism that can be organized at different levels of analysis (Cattaneo & Goodman, 2005). For example, at the individual level, variables related to IPVAW offender recidivism include age (i.e., being younger; Fitzgerald & Graham, 2016; Wooldredge & Thistlethwaite, 2002), race/ethnicity (Fitzgerald & Graham, 2016; Kingsnorth, 2006; Mears, Carlson, Holden, & Harris, 2001), low educational level (Wooldredge & Thistlethwaite, 2002), history of abuse as a child (Lauch, Hart, & Bresler, 2017), alcohol and drug misuse and abuse (Cattaneo & Goodman, 2003; Romero-Martínez, Lila, Gracia, & Moya-Albiol, 2019), antisocial and borderline psychological disorders (Carbajosa, Catalá-Miñana, Lila, & Gracia, 2017; Holtzworth-Munroe, Meehan, Herron, Rehman, & Stuart, 2003; Llor-Esteban, García-Jiménez, Ruiz-Hernández, & Godoy-Fernández, 2016; Thijssen & de Ruiter, 2010), anger problems (Farzan-Kashani & Murphy, 2017), and pro-IPVAW attitudes (Hanson & Wallace-Capretta, 2004; Llor-Esteban et al., 2016). Variables related to recidivism at the relational and contextual levels include remaining with the same partner (Capaldi, Shortt, & Crosby, 2003), accumulation of stressful life events (López-Ossorio, González-Álvarez, Buquerín, García, & Buela-Casal, 2017), low social support (Lodewijks, de Ruiter, & Doreleijers, 2010), living in disadvantaged areas (Fitzgerald & Graham, 2016), and unemployment (Feder & Dugan, 2002). Other variables related to recidivism include legal variables such as any prior arrest, previous criminal history, IPVAW arrest or jail sentence (Collins, Bouffard, & Wilkes, 2019; Davis, Smith, & Nickles, 1998; Fitzgerald & Graham, 2016; Kingsnorth, 2006), high risk of recidivism assessed by therapists (Goodman, Dutton, & Bennett, 2000), and treatment dropout (Gondolf, 2000; Lauch et al., 2017; Romero-Martínez et al., 2019; Stoops, Bennett, & Vincent, 2010).

Although this body of literature offers relevant information on the variables associated with IPVAW offender recidivism, however, primary research seldom uses a multifactorial approach that simultaneously includes multiple variables at different levels in the same research design to assess more accurately their predictive value in the context of a wider set of variables.

The Present Study

Efforts to increase BIP effectiveness in reducing recidivism should focus on key predictive variables of this outcome. To this end, in the present study we analyze the association between recidivism and a large set of variables drawn from a sample of IPVAW offenders court-mandated to a community-based BIP. Key predictors of recidivism will be identified from four sets of variables included in this study: (1) individual-level variables (i.e., socio-demographic variables, substance abuse, family violence exposure, personality and psychological adjustment, empathy, anger, anxiety, impulsivity, self-esteem, sexism, attitudes towards violence, and attributions of responsibility); (2) relational- and contextual-level variables (i.e., community social support, intimate support, accumulation of stressful life events, perceived social rejection); (3) violence-related variables (i.e., risk of future violence assessed by BIP staff, presence of physical violence in judicial sentence, and length of sentence); and (4) intervention process-related variables (i.e., dropout, intervention dose, homework activities, motivation to change, and stage of change).

To identify the best predictors of recidivism among these variables, a Cox regression (Cox, 1972) will be used. Cox regression is a type of survival analysis that takes into account not only the association between predictor variables and the probability of an event occurring (recidivism), but also the time elapsed before the event. Given the large number of predictive variables and the moderate size of the sample, we will address this issue using the adaptive least absolute shrinkage and selection operator (ALASSO). This is a penalized regression method that has an important advantage: it meets the oracle property, ensuring high prediction accuracy and selection of the most relevant predictive variables. Thus, the coefficients of the best predictors are automatically selected and estimated in a single step, and model overfitting is avoided (Zhang & Lu, 2007; Zou, 2006). To the best of our knowledge, this is the first time that this methodological approach has been used to identify key predictors of recidivism among IPVAW offenders attending BIPs.

Method

Sample

The study sample comprised 393 IPVAW male offenders sentenced to less than two years in prison (M = 10.08 months, SD = 7.05), without previous criminal records, and court-mandated to a community-based BIP in Spain. Participants were between the ages of 18 and 81 (M = 40.32, SD = 11.60); 8.90% of the sample had college degrees (n = 35), 34.86% had finished high school (n = 137), 50.89% had completed elementary studies (n = 200), and 5.34% had no schooling (n = 21); 23.66% of the sample were married or in a relationship (n = 93), 38.17% were single (n = 150), and 37.14% were divorced (n = 146); 74.55% were Spanish (n = 293), and 26.45% were

Table 1. Predictor Variables Included in the Model, Measures Description, and Descriptive Statistics (N = 393) (continued)

Category	Predictor variable	Measure description, Omega, Means (SD) or %
Individual variables		
Socio-demographic	Age	Years
	Marital status	1: married; 2: single; 3: divorced
	Immigrant status	1: Yes (immigrant); 2: No (native)
	Work status	1: Yes (employed); 2: No (unemployed)
	Annual household income	1≤ €1,800; 2: €1,800-€3,600; 3: €3,600-€6,000; 4: €6,000-€12,000; 5: €12,000-€18,000; 6: €18,000-€24,000; 7: €24,000-€30,000; 8: €30,000-€36,000; 9: €36,000-€60,000; 10: €60,000-€90,000; 11: €90,000-€120,000; 12 ≥ €120,000.
	Educational level	1: no schooling; 2: elementary studies; 3; high school; 4: college degree
Substance abuse	Hazardous and harmful alcohol consumption	*Alcohol Use Disorders Identification Test* (AUDIT; Babor & Grant, 1989; Spanish version by Contel Guillamón, Gual Solé, & Farran Colom, 1999). 10 items. Response scale; 0: *never*, 4: *daily or almost daily*. Two indicators: total score and cutoff score (≥8). ω_{total} = 81.81 (*M* = 0.18, *SD* = 0.39).
	Alcoholism problems	*CAGE Questionnaire* (Mayfield, McLeod, & Hall, 1974). 4 items. Response scale; 1: Yes; 2: Not. ω_{total} = 81.76 (*M* = 7.28, *SD* = 1.15).
	Alcohol dependence	*Alcohol Dependence scale* of the *Millon Clinical Multiaxial Inventory-III* (MCMI-III; Millon, 2007; Spanish version by Cardenal & Sánchez, 2007) (*M* = 46.26, *SD* = 28.00).
	Drug dependence	*Drug Dependence scale* of the *Millon Clinical Multiaxial Inventory-III* (MCMI-III; Millon, 2007; Spanish version by Cardenal & Sánchez, 2007) (*M* = 45.03, *SD* = 25.15).
Family violence exposure	Family violence exposure and/or victimization during childhood and/or adolescence.	Item 6 of the *Spousal Assault Risk Assessment Guide* (SARA; Kropp, Hart, Webster, & Eaves, 1999; Spanish version by Andrés Pueyo, López, & Álvarez, 2008). Response scale; 0: *no presence*, 1: *possibly present*, 2: *present* (*M* = 0.39, *SD* = 0.69).
Clinical symptomatology	*Symptom dimensions*: Somatization, Obsessive-compulsive, Interpersonal sensitivity, Depression, Anxiety, Hostility, Phobic anxiety, Paranoid ideation, Psychoticism, Global severity index, Positive Symptom distress index, and Positive symptom total.	*The Symptom Checklist-90-Revised* (SCL-90-R; Derogatis, 1977; Spanish version by De las Cuevas et al., 1991). 90 items. Response scale; 0: *never*, 4: *almost always*. Somatization (*M* = 1.38, *SD* = 3.42), Obsessive-compulsive (*M* = 0.57, *SD* = 0.57), Interpersonal sensitivity (*M* = 0.44, *SD* = 0.59), Depression (*M* = 0.68, *SD* = 1.32), Anxiety (*M* = 0.39, *SD* = 0.48), Hostility (*M* = 0.19, *SD* = 0.32), Phobic anxiety (*M* = 0.26, *SD* = 0.88), Paranoid ideation (*M* = 0.62, *SD* = 0.68), Psychoticism (*M* = 0.27, *SD* = 0.43), Global severity index (*M* = 0.42, SD = 0.38), Positive Symptom distress index (*M* = 22.02, *SD* = 15.65), Positive symptom total (*M* = 1.59, *SD* = 0.75).
	Personality disorders: Schizoid, Avoidant, Depressive, Dependent, Histrionic, Narcissistic, Antisocial, Aggressive, Compulsive, Passive-Aggressive, Self-defeating. *Severe personality disorders*: Schizotypal, Borderline and Paranoid. *Clinical syndromes:* Anxiety, Somatoform, Bipolar, Dysthymia, Post-traumatic stress disorder. *Severe Syndromes*: Thought disorder, Major depression, Delusional disorder.	*Millon Clinical Multiaxial Inventory-III* (MCMI-III; Millon, 2007; Spanish version by Cardenal & Sánchez, 2007). 175 items. Response scale: 1: True; 2: False. Schizoid (*M* = 40.59, *SD* = 22.36), Avoidant (*M* = 31.95, *SD* = 22.77), Depressive (*M* = 29.92, *SD* = 24.51), Dependent (*M* = 35.46, *SD* = 21.20), Histrionic (*M* = 49.07, *SD* = 17.67), Narcissistic (*M* = 68.43, *SD* = 16.01), Antisocial (*M* = 42.88, *SD* = 23.30), Aggressive (*M* = 37.78, *SD* = 23.55), Compulsive (*M* = 64.02, *SD* = 21.23), Passive-aggressive (*M* = 37.72, *SD* = 23.34), Self-defeating (*M* = 28.08, *SD* = 22.97), Schizotypal (*M* = 29.70, *SD* = 26.16), Borderline (*M* = 32.23, *SD* = 24.05), Paranoid (*M* = 43.78, *SD* = 28.54), Anxiety (*M* = 45.61, *SD* = 34.23), Somatoform (*M* = 28.85, *SD* = 25.77), Bipolar (*M* = 50.08, *SD* = 23.84), Dysthymia (*M* = 26.71, *SD* = 42.60), Post-traumatic stress disorder (*M* = 30.68, *SD* = 27.02), Thought disorder (*M* = 31.51, *SD* = 27.98), Major depression (*M* = 27.14, *SD* = 27.50), Delusional disorder (*M* = 45.74, *SD* = 31.99).
Empathy	Perspective taking, Fantasy, Emotional empathic concern, and Personal distress.	*Interpersonal Reactivity Index* (IRI; Davis, 1983; Spanish version by Mestre, Frías, & Samper, 2004). 28 items. Response scale; 1: *doesn't describe me at all*, 5: describes me very well. ω_{total} = .85. Perspective taking (*M* = 23.24, *SD* = 5.11), Fantasy (*M* = 17.21, *SD* = 4.75), Emotional empathic concern (*M* = 24.96, *SD* = 4.55) and Personal distress (*M* = 14.30, *SD* = 4.64).
Attribution of responsibility	Responsibility attributed to the legal context; Responsibility attributed to the victim; Responsibility attributed to the offender's personal context.	*Intimate Partner Violence Responsibility Attribution Scale* (IPVRAS; Lila, Oliver, Catalá-Miñana, Galiana, & Gracia, 2014). 12 items. Response scale; 1: *strongly disagree*; 5: *strongly agree*. ω_{total} = .83 Legal context (*M* = 16.91, *SD* = 5.23), Victim (*M* = 8.84, *SD* = 3.43) and Offender's personal context (*M* = 10.82, *SD* = 4.13). Participants' responsibility assumption assessed by therapist. 1 item. Response scale; 1: *not at all*, 5: *very much* (*M* = 2, *SD* = 1.15).
Attitudes	Hostile and benevolent sexism	*Ambivalent Sexism Inventory* (ASI; Glick & Fiske, 1997; Spanish version by Expósito, Moya, & Glick, 1998). 22 items. Response scale; 1: *strongly disagree*, 5: *strongly agree*. Hostile sexism: ω = .89 (*M* = 26.17, *SD* = 13.54); Benevolent sexism: ω = .84 (*M* = 31.00, *SD* = 12.81).
	Perceived severity of IPVAW	*Perceived Severity of IPVAW Scale* (PS-IPVAW; Gracia, García, & Lila, 2008, 2009; Lila, Gracia, & García, 2013). 8 IPVAW scenarios. Response scale; 0: *not at all severe*, 10: *extremely severe*. ω_{total} = .89 (*M* = 71.87; *SD* = 11.58).

Table 1. Predictor Variables Included in the Model, Measures Description, and Descriptive Statistics (N = 393) (continuation)

Category	Predictor variable	Measure description, Omega, Means (SD) or %
Individual variables		
Psychological adjustment	State and Trait Anxiety	*State-Trait Anxiety Inventory* (STAI; Spielberger, Gorsuch, & Lushene, 1970; Spanish version by Virella, Arbona, & Novy, 1994). 40 items. Response scale; 0: *not at all/almost never*, 3: *very much/almost always*. State anxiety (M = 18.53, SD = 11.25); Trait anxiety (M = 19.63; SD = 12.07).
	Depressive symptomatology	*Center for Epidemiologic Studies Depression Scale-7* (CESD-7; Radloff, 1977; short version by Herrero & Gracia, 2007). 7 items. Response scale; 1: *rarely or never, less than 1 day*, 4: *all the time or most of the time, 5-7 days*. ω_{total} = .89 (M = 12.94;, SD = 5.59).
	Global self-esteem	*Rosenberg Self-Esteem Scale* (Rosenberg, 1965; Spanish version by Martín-Albo, Núñez, Navarro, & Grijalvo, 2007). 10 items. Response scale; 1: *totally disagree*, 4: *totally agree*. ω_{total} =.79 (M = 61.49, SD = 9.61).
	Social self-esteem; Familiar self-esteem; Emotional self-esteem; Intellectual self-esteem; Physical self-esteem; Total self-esteem.	*Self-esteem Questionnaire* (AUT-17; Gracia, Herrero, & Musitu, 2002). 17 items. Response scale; 1: *totally disagree*, 5*: totally agree*. ω_{total} = .83. Social self-esteem (M = 10.24, SD = 3.04); Familiar self-esteem (M = 16.75, SD = 3.49); Emotional self-esteem (M = 12.19, SD = 2.46); Intellectual self-esteem (M = 10.73, SD = 3.01); Physical self-esteem (M = 11.59, SD = 3.25); Total self-esteem (M = 32.37, SD = 4.56).
	State anger; Feeling angry; Expressing anger verbally; Expressing anger physically; Trait anger.	*State-Trait Anger Expression Inventory* (STAXI-2; Spielberger, 1999; Spanish version by Miguel-Tobal, Casado, Cano-Vindel, & Spielberger, 2001). 44 items. Response scale; 1: *not at all*, 4: *very much*. State anger (M = 16.52, SD = 3.34), Feeling angry (M = 6.09,SD = 2.14), Expressing anger verbally (M = 5.49, SD = 1.81), Expressing anger physically (M = 5.09, SD = 0.59), Trait anger (M = 15.63, SD = 4.83).
	Impulsivity	*Plutchick Impulsivity Scale* (Plutchik & van Praag, 1989; Spanish version by Páez et al., 1996). 15 items. Response scale; 1: *never*, 4: *almost always*. ω = .83 (M = 27.91, SD = 10.27).
Relational-contextual variables		
Community social support	Community integration; Community participation; Support from formal organizations; Support from voluntary groups and organizations.	*Perceived Community Support Questionnaire* (Gracia et al., 2002). 18 items. Response scale; 1: *completely disagree*, 4: *completely agree*. ω_{total} = .90. Community integration (M = 13.95, SD = 3.45), Community participation (M = 13.85, SD = 5.59), Support from formal organizations (M = 14.49, SD = 3.86), Support from voluntary groups and organizations (M = 17.95, SD = 5.23).
Intimate support	Intimate social support	*Intimate Social Support Questionnaire* (Lin, Dean, & Ensel, 1986; Spanish version by Herrero, Gracia, Fuente, & Lila, 2012). 3 items. Response scale; 1: *most of the time*, 5: *never*. ω = .61 (M = 11.12, SD = 3.02).
Stressful life events accumulation	Stressful life events experienced during the last six months.	S*tressful Life Events Inventory* (Gracia & Herrero, 2004). 33 items. The participant must choose the events he may have experienced from the list (M = 3.34, SD = 3.13).
Social rejection	Perceived social rejection	*Perceived Social Rejection Index* (PSRI; Catalá-Miñana, Lila, & Oliver, 2013). 13 items. Response scale; 1: *completely agree*, 5: *completely disagree*. ω = .75 (M = 27.95, SD = 6.29).
Violence-related variables		
Risk of future violence	Risk of future IPVAW; Risk of future violence against non-partners (assessed by program staff).	Two risk ratings of future violence from the *Spousal Assault Risk Assessment Guide* (SARA; Kropp et al., 1999; Spanish version by Andrés Pueyo et al., 2008). Two risk ratings based on 20 risk factors. Response scale; 0: *low*, 1: *moderate*, 2: *high*. Risk of future IPVAW (M = 0.75, SD = 0.78). Risk of future violence against non-partners (M = 0.40, SD = 0.63).
Physical violence	Conviction for IPVAW that involve physical violence.	Presence at participants' legal sentence of physical IPVAW. Response scale; 0: No, 1: Yes (68%).
Length of sentence	Length of imprisonment sentence	Number of months of imprisonment (M = 10.68, SD = 6.85)
Intervention process-related variables		
Dropout	To stop attending BIP after the evaluation phase had started.	Dropout after first program attendance. Response scale; 0: No, 1: Yes (19%)
Intervention dose	Sessions attended by participant	Number of sessions attended by participant (M = 25.45, SD = 9.08)
Homework activities	Homework activities	Number of homework activities accomplished by participant (M = 9.87, SD = 5.80).
Motivation of change	Stage of change	Stage of change assessed by therapists (Carbajosa, Catalá-Miñana, Lila, Gracia & Boira, 2017). Response scale; 1: precontemplation, 2: contemplation, 3: preparation, 4: action, 5: maintenance (M = 1.18, SD = 0.42).
	Motivation to change	Participants' motivation to change assessed by therapist. 1 item. Response scale; 1: *not at all*, 5: *very much* (M = 2.11, SD = 1.19).

immigrants (n = 100); median family yearly household income was between €6,000 and €12,000; 45.29% of the participants were unemployed (n = 178); 64.6% completed the BIP, 28.5% were still attending the BIP, and 6.9% left the BIP before completing it.

Procedure

All participants were referred to the BIP by penitentiary social services. Data were gathered as part of regular in-take (pre-treatment) and final (post-treatment) data collection for IPVAW offenders entering the program. All predictor variables included in the study were assessed at baseline with the exception of five intervention process-related variables obtained when participants finished the BIP. Official recidivism data for the total sample were obtained up to February, 2019. IPVAW offenders who agreed to participate in this study signed a written consent form, and confidentiality was guaranteed. Participants were informed that neither participation nor refusal would affect their legal situation. Instruments were administered with the help of the intervention program staff. The University of Valencia Ethics Committee approved the study (ref. nº H1537520365110).

Measures

Dependent variable: recidivism. The dependent variable considered in this study was official recidivism. Recidivism data were provided by the Ministry of the Interior and recidivism is defined as any further incident of IPVAW violence or any breach of the conditions mandated by a judge (e.g., mandatory no-contact order) committed by participants after their first program attendance (i.e., initial assessment session). This dependent variable refers to whether an IPVAW offender recidivated (Yes/No). Time was also considered in this variable, measured as the number of months between the last contact with the BIP (date of program termination or date of program dropout) and the date of the recidivism event, yielding a recidivism follow-up period of between 0 and 69 months. This variable included censored cases, meaning that for some participants the event of interest (i.e., recidivism) had not occurred at the time the data were analyzed.

Predictor variables. The study included 89 variables as potential key predictors of recidivism based on official data. Four sets of variables were considered as key potential predictors of recidivism: individual-level variables, relational- and contextual-level variables, violence-related variables, and intervention process-related variables. These sets of variables are described in Table 1.

Data Analyses

We first obtained the descriptive statistics for each variable and established the internal consistency for each of the scales used as predictors in the study. To this end, we used the omega total statistic (ω_t), which is theoretically more suitable than other statistics when the items present some skew and are not tau-equivalent, as was the case of most of the variables presented in Table 1 (McNeish, 2015; Revelle, 2018; Trizano-Hermosilla & Alvarado, 2016).

We then used a Cox regression—a type of survival analysis—to identify the key predictors of recidivism over time (Cox, 1972; Petersson & Strand, 2017; Stansfield & Williams, 2014). Cox's regression is typically preferred over classic regression models as it assesses both the time elapsed before an event and its probability of occurrence. However, when the number of predictors is large and the sample size is small or moderate, regression models could be overfitted, leading to regression coefficients that can overestimate the effect of a particular predictor, and inflating the magnitude of otherwise superfluous variables (Babyak, 2004; Cohen, Cohen, West, & Aiken, 2003). Given the large number of variables used in this study and the moderate size of the sample, we used penalized regression method to estimate Cox regression coefficients, as they are the optimal solution to this overfitting issue (Helwig, 2017; McNeish, 2015). The underlying idea behind these methods is to penalize the regression coefficients in order to obtain a parsimonious model, including in the analysis only the most relevant predictors to account for the observed phenomena in a single step.

In this study we used the adaptive least absolute shrinkage and selection operator (ALASSO), which is a penalized regression method that meets the oracle property (i.e., it consistently selects the same set of predictors and yields the same estimates for the model parameters; Zhang & Lou, 2007; Zou, 2006). The ALASSO shrinks to zero the estimates of those predictors that do not contribute sufficiently to the model:

$$L^{alasso}(\beta) = \|Y - X\beta\|^2 + \lambda W|\beta|$$

where L is the penalized regression function, X is the matrix for the predictors, Y is the vector of responses, β are the regression coefficients of each predictor, λ the regularization parameter of shrinkage, and W is a weighting vector that imposes a different penalization for each variable. The weighting vector in the ALASSO is based on the estimated ridge regression coefficients—which is equivalent to equation (1) without the W vector—where $W = 1/\beta_{ridge}$. Estimates of β are obtained by minimizing the L^{alasso} function.

The shrinkage parameter for the ALASSO (i.e., λ) was computed through cross-validation, splitting the sample into ten folds (McNeish, 2015). Each fold is used to fit the model, except one that assesses the model performance. The process is repeated ten times, ensuring that each fold is used once to test the model. Once this process is completed, the mean squared error is averaged and used to compute a λ value for each fold. The value for λ is then changed and the process continues to iterate for 100 values of λ. The value of λ with the smallest squared error is finally used to penalize the β coefficients of the model. Following Helwig's (2017) suggestion, a non-parametric bootstrap was performed to obtain the estimation errors and confidence intervals of the model parameter estimates (i.e., the β coefficients) (Efron & Tibshirani, 1994). To this end, the Cox regression model was fitted separately to 10,000 samples of 300 participants (with replacement). The resampled parameter estimates were then used to compute the confidence intervals.

In order to assess the model performance, a receiving operator characteristic (ROC) curve was performed with the remaining 93 participants. The area under the curve (AUC) was used to test the accuracy of the model. The ROC curve is constructed by plotting the true positive rate (i.e., sensitivity) against the false positive rate (i.e., 1-specifity), informing how much the model is able to distinguish between recidivist and non-recidivist participants. AUC values above .70 indicate a fair model, above .80 a good model, and above .90 an excellent model (Hosmer & Lemeshow, 2000).

All analyses were conducted with the R statistical package (R Core Team, 2018), using the glmnet and pROC libraries (Robin et al., 2011; Simon, Friedman, Hastie, & Tibshirani, 2011).

Results

The overall recidivism of the offenders included in the sample was 15.01%. Of them, 49.16% recidivated during the first 12 months after the first contact with the BIP (i.e., 7.88% of the total sample), and almost 75% of the offenders who recidivated did so after 33 months (i.e., 11.45% of the total sample). This percentage increases to almost 90% 48 months after the first contact with the BIP (i.e., 13.99% of the total sample) (see Figure 1). The percentage of those

participants who completed the program and recidivated was 7.63% (7.38% after the first 12 months). The complete set of 89 predictors was included in the model, involving individual-level variables, relational- and contextual-level variables, violence-related variables, and intervention process-related variables. Categorical variables were dummy coded, the lower category of ordinal variables was fixed to zero, and continuous variables were standardized (with the exception of age, which was mean-centered), before being introduced in the survival analysis. We then conducted the Cox regression via ALASSO, which penalizes the regression coefficients and selects the best predictors in the data set (see Table 2).

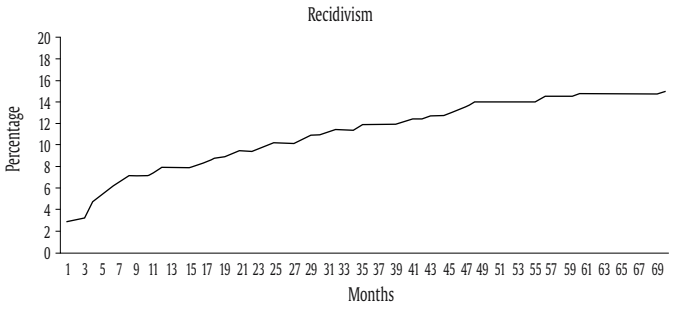

Figure 1. Intimate Partner Violence Offender Recidivism over Time.

Table 2. Cox Regression Coefficients and Hazard Ratios

	β	*SE*	exp(β)	95% CI [lower-upper]
Immigrant status	.223	.053	1.26	[1.14-1.40]
Family violence exposure	.275	.003	1.32	[1.31-1.32]
Trait anger	.135	.015	1.14	[1.11-1.18]
Stressful life events	.207	.021	1.23	[1.18-1.28]
Risk of future violence against non-partners	.449	.012	1.57	[1.53-1.60]
Dropout	.695	.007	2.00	[1.98-2.03]

Note. β = adaptive least absolute shrinkage and selection operator β coefficients; *SE* = standard error; exp(β) = Cox regression hazard ratios; 95% CI = hazard ratios confidence interval.

The ALASSO regression dropped from the model the β coefficients of those predictors less related to the dependent variable (i.e., recidivism) by directly fixing them to zero. The predictors included in the final model were immigrant status (i.e., whether participants were immigrant or Spanish), family violence exposure, risk of future violence against non-partners, trait anger, accumulation of stressful life events, and program dropout.

After estimating the ALASSO coefficients, we computed the hazard ratios (HR) for each variable, i.e., exp(β) (see Table 2). In this context, the HR express how much the probability of occurrence of the event (i.e., recidivism) increases per unit of each predictor. All the HR were above 1, indicating that as the values of the predictive variables increase, the probability of recidivism also increases. Dropout was the predictor with the largest effect, as the probability of recidivism was 100% higher for participants who dropped out of the program. Risk of future violence against non-partners had the second largest effect, increasing the probability of recidivism by 53% for every point that this variable increased (i.e., 0% for participants with no risk, 53% for participants with moderate risk, and 106% for participants with high risk). Thirdly, the predictor family violence exposure increased the probability of recidivism by 32% among participants who had been exposed to violence during their childhood or adolescence. In the same line, immigrant participants had a 26% higher probability of recidivism than Spanish participants. Accumulation of stressful life events was found to increase the probability of recidivism by 23% for each standard deviation that this variable increases (e.g., 0% for those participants in the mean, 23% for participants one standard deviation above the mean, 46% for participants two standard deviations above the mean, etc.). Trait anger was the last predictor included in the Cox regression, increasing the probability of recidivism by 14% for each standard deviation that this variable increases (e.g., 0% for participants in the mean, 14% for participants one standard deviation above the mean, 28% for participants two standard deviations above the mean, etc.).

Finally, a ROC curve was computed to assess the accuracy of the model, testing how well the model distinguished between recidivist and non-recidivist participants. The AUC of our model was .808, indicating the model's good predictive ability; specifically, the model correctly classified 80.8% of the cases (Figure 2).

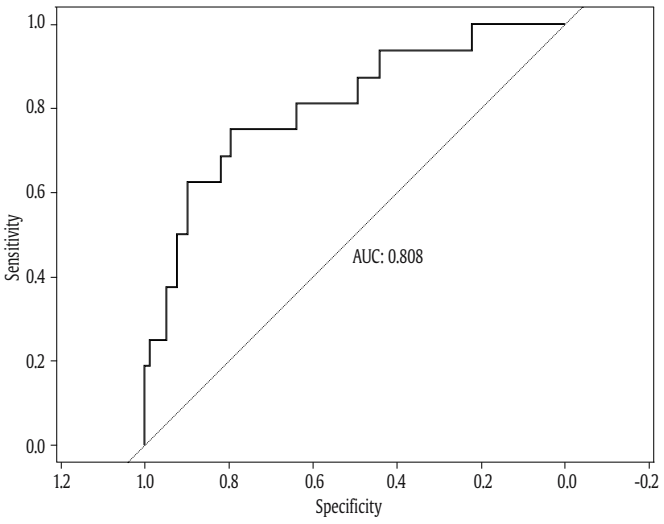

Figure 2. ROC Curve for the ALASSO Cox's Regression Model.

Discussion

The aim of this study was to identify key predictors of recidivism from a large set of variables drawn from a sample of IPVAW offenders court-mandated to a community-based BIP, with a follow-up period of between 0 and 69 months. From a pool of eighty-nine variables, six were selected as key predictors: dropout, risk of future violence against non-partners, family violence exposure, immigrant status, accumulation of stressful life events, and trait anger. The predictive model based on these variables correctly classified 80.8% of the cases.

Official recidivism was the dependent variable in our study. For the whole study period (69 months), the recidivism rate for the total sample was 15.01% and 7.63% for those who completed the program. Previous studies have found recidivism rates ranging from 15 to 60%. Recidivism in BIP studies varies significantly depending on the source of information (i.e., recidivism rates based on victims' reports are higher than rates based on offenders' or official reports only), and length of follow-up (i.e., recidivism rates are higher for longer follow-up periods) (Hilton, Harris, Popham, & Lang, 2010; Klein & Tobin, 2008; Lin et al., 2009; Loinaz, 2014). In line with other studies, our results also showed higher rates of recidivism during the first year after program completion, with a percentage of recidivism for the total sample during this period of 7.88% (Goldstein, Cantos, Brenner, Verborg, & Kosson, 2016; Loinaz, 2014; Petersson & Strand, 2017; Richards, Jennings, Tomsich, & Gover, 2014; Stansfield & Williams, 2014).

Regarding the key predictors selected in this study, dropout was the variable with the largest effect associated with IPVAW offenders' recidivism (dropout percentage in our study was 19.34%). Our results build on evidence from previous studies showing that BIP completers are less likely to re-offend than dropouts (Eckhardt, Holtzworth-Munroe, Norlander, Sibley, & Cahill, 2008; Gordon & Moriarty, 2003; Hamberger & Hastings, 1988; Jones, D'Agostino, Gondolf, & Heckert, 2004). Dropout is a common issue in this type of program, with rates ranging from 15% to 58%, and is one of the main problems affecting BIP effectiveness (Babcock et al., 2004; Bennett, Stoops, Call, & Flett, 2007; Daly & Pelowski, 2000; Feder & Wilson, 2005; Jewell & Wormith, 2010; Lila, Gracia, & Catalá-Miñana, 2017; Olver, Stockdale, & Wormith, 2011; Rondeau, Brodeur, Brochu, & Lemire, 2001). Clearly, reducing BIP dropout rates remains one of the main challenges in this field. Available research suggests that one of the most promising approaches for achieving this goal are interventions based on motivational strategies (Alexander, Morris, Tracy, & Frye, 2010; Babcock et al., 2016; Crane & Eckhardt, 2013; Eckhardt et al., 2013; Lila et al., 2018; Musser, Semiatin, Taft, & Murphy, 2009; Santirso, Martín-Fernández, Lila, Gracia, & Terreros, 2018). In this regard, one of the main contributions of our study is not only to underline dropout as a key risk factor associated with recidivism, but also the need to reduce it as one of the main priorities in BIPs.

The risk of future violence against non-partners was the key predictor with the second largest effect on recidivism. Generality of violence (i.e., being violent towards others outside the family context vs. being violent only within the family) is one of the main dimensions used to identify IPVAW offender typologies (Holtzworth-Munroe & Stuart, 1994), and previous studies have validated the usefulness of this dimension to differentiate between generally violent/antisocial and family-only subtypes of IPVAW offenders (Cantos & O'Leary, 2014; Juarros, Herrero, Fernández, Pérez, & Rodríguez, 2018; Petersson, Strand, & Selenius, 2016; Weber, Taylor, Cantos, Amado, & O'Leary, 2019). There is evidence of a higher risk of recidivism among antisocial or generally violent IPVAW offenders than family-only IPVAW offenders (Carbajosa, Catalá-Miñana, Lila, & Gracia, 2017; Goldstein et al., 2016; Huss & Ralston, 2008; Petersson & Strand, 2017). Although in our study we did not use IPVAW offender typologies, those participants with higher scores in risk of future violence against non-partners could be classified as generally violent/antisocial (Carbajosa, Catalá-Miñana, Lila, & Gracia, 2017). Our results support the idea that risk assessment and management of those generally violent participants should be a key intervention target to improve BIP effectiveness (Arbach & Bobbio, 2018; Bowen, 2011; Cantos, Kosson, Goldstein, & O'Leary, 2019; López-Ossorio et al., 2018; Snead, Bennett, & Babcock, 2018).

The third key predictor in this study was family violence exposure earlier in life. Exposure to family violence during childhood is one of the most frequently recognized risk factors of IPVAW perpetration (Capaldi, Knoble, Shortt, & Kim, 2012; Fleming et al., 2015; Gracia, Rodríguez, Martín-Fernández, & Lila, 2017; Mbilinyi et al., 2012; Ruddle, Pina & Vasquez, 2017). Our results underline the importance of this key predictor also in IPVAW offender recidivism (see also, Fowler, Cantos, & Miller, 2016). Family violence exposure during childhood negatively influences crucial developmental processes (Ruddle et al., 2017). As Fowler et al. (2016) point out, understanding the effect that family violence exposure has on IPVAW offenders may be important in reducing recidivism rates. Early family violence exposure among IPVAW offenders could have long-term consequences such as mental health problems, poor emotional regulation, greater acceptability and normalization of violence, a tendency towards aggression, and attachment problems; consequently it should be acknowledged, assessed, and addressed in BIPs (Card, Stucky, Sawalani, & Little, 2008; Dutton & White, 2012; Gracia, Lila, & Musitu, 2005; Malinosky-Rummell & Hansen, 1993; Martín-Fernández, Gracia, & Lila, 2018; O'Leary, Smith, Slep & O'Leary, 2007; Ruddle et al., 2017).

Immigrant status was the fourth key predictor of recidivism identified in our analyses. Although research on the relationship between immigrant status and IPVAW perpetration remains inconclusive (Erez, Adelman, & Gregory, 2009; Gupta et al., 2010), our results provide strong evidence that immigrant status deserves special consideration as a predictor of IPVAW recidivism (see also Raj & Silverman, 2002; Vaughn et al., 2014). In Spain, where this study was conducted, around half of the participants in BIPs are immigrants (Carbajosa, Lila, Negredo, & Pérez, 2011; Echauri, Fernández-Montalvo, Martínez, & Azcárate, 2013), and one third of all reported IPVAW cases are perpetrated by immigrants (Consejo General del Poder Judicial, 2018). Risk of femicide is also associated with immigrant status (Sanz-Barbero, Heras-Mosterio, Otero-García, & Vives-Cases, 2016). Immigrant women in Spain exposed to IPV are five times more likely to be murdered than Spanish women (Sanz-Barbero et al., 2016; Vives-Cases, Ruiz-Cantero, Escribà-Agüir, & Miralles, 2010). In this regard, a WHO report on intimate partner violence against migrant and ethnic minority women (Vives-Cases et al., 2014) identifies these highly vulnerable social groups as deserving special attention. Regarding offenders, although some studies conducted in Spain found that immigrants participating in BIPs benefit from the intervention in several proximal outcomes such as attitudes towards IPVAW and psychological adjustment (Echauri et al., 2013; Vargas, Lila, & Catalá-Miñana, 2015), our study emphasizes the need for further efforts to reduce recidivism rates among this group of IPVAW offenders. Training professionals in managing cultural differences and implementing culturally adapted BIPs are intervention strategies that deserve further attention and research to examine their potential to reduce IPVAW recidivism rates among immigrants (Ellsberg et al., 2015; Gondolf, 2012).

Stressful life events and trait anger were the last key predictors of recidivism identified in this study. The role of stressful life events in explaining violence has long been supported in the literature (e.g., Agnew, 1992; Hirschi, 1969; Silver & Teasdale, 2005). The accumulation of stressful life events has been related to IPVAW offenders' psychological adjustment and attributions of responsibility, and has been found to increase both the occurrence of violence and its stability over time (Gracia, Herrero, Lila, & Fuente, 2009; Lanier & Maume, 2009; Lila, Gracia, & Murgui, 2013; Silver & Teasdale, 2005). Some specific stressful events, such as employment problems, have been closely related to general violence recidivism (Bonta & Andrews, 2016). However, with a few exceptions, there is little research into the effects of accumulated stressful life events among IPVAW offenders (Capaldi et al., 2012; Choi, Cheung, & Cheung, 2012). Previous studies have also linked trait anger with IPVAW (Barbour, Eckhardt, Davison, & Kassinove, 1998; Farzan-Kashani & Murphy, 2017; Norlander & Eckhardt, 2005), and IPVAW treatment response (Murphy, Taft, & Eckhardt, 2007). Our results reveal the need to implement training in coping strategies, stress-control techniques, and anger management in BIPs, along with extended monitoring or intensive intervention for IPVAW offenders with accumulated stress or anger problems (Maiuro & Eberle, 2008; Maiuro, Hagar, Lin, & Olson, 2001). Some research also suggests new approaches based on enhanced mindfulness to deal with IPVAW offenders' anger and stress-related problems, such as dialectical behavior therapy (Linehan, 1993) or acceptance and commitment therapy (Eifert, McKay, & Forsyth, 2006).

This study has both strengths and limitations. One of its main strengths is the multifactorial approach used to identify the key predictors of IPVAW offender recidivism out of a large set of variables (i.e., individual, relational and contextual, violence-related, and intervention process-related variables). Recidivism was studied by means of survival analysis rather than linear or logistic regression, as it takes into account not only whether participants recidivated, but also the time elapsed since their first contact with the BIP. The use of the ALASSO to carry out this analysis was another strength of this study; unlike conventional regression methods, it allowed us

to obtain more accurate regression coefficients—avoiding possible overfitting issues—and select the best predictors of recidivism in a single step (McNeish, 2015; Zhang & Lu, 2007). To the best of our knowledge, this is the first time that penalized regression methods have been used to examine recidivism among BIP participants/users. The cross-validation approach used to test and re-test the Cox regression model through the ROC curve was also a strength of this study, since the six variables included in the final model were able to discriminate reasonably well between participants who recidivated and those that did not.

The first of the study's limitations concerns the use of official recidivism rates as the dependent variable. Because victims' reports of offender recidivism (compared to offender or official reports) tend to yield higher recidivism rates, relying on data from official reports underestimates the amount of actual recidivism (Cheng, Davis, Jonson-Reid, & Yaeger, 2019; Goldstein et al., 2016; Williams & Houghton, 2004). However, this was not possible in this study because Spanish legislation prevents the services referring IPVAW perpetrators to intervention programs from providing information that would allow access to their victims (Lila et al., 2018). Second, the immigrant status condition included participants from different countries of birth, with very different cultural backgrounds and social conditions. Immigrants are not a homogeneous social group (Vives-Cases et al., 2013), and future research dealing with cultural adaptation in BIPs should have deeper knowledge of the differences among immigrant subgroups. Finally, in spite of the advantages of ALASSO over conventional estimation methods (e.g., OLS), the software available to conduct the analyses did not provide estimation errors for the estimated regression coefficients, hampering the computation of confidence intervals for the hazard ratios. However, we addressed this issue by carrying out a non-parametric bootstrap, as suggested by Helwig (2017).

In conclusion, IPVAW is a social and public health problem that deserves more informed and better targeted interventions. The results of our study provide a set of six key risk predictors of IPVAW offender recidivism. These key predictors should be taken into account by professionals and researchers in this field to improve their evaluation and intervention strategies, and thus increase BIP effectiveness.

Conflict of Interest

The authors of this article declare no conflict of interest.

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