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Does history of childhood maltreatment make a difference in prison? A hierarchical approach on early family events and personality traits



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ARTICLE INFO

Article history:

Received 3 June 2013

Received in revised form

19 October 2014

Accepted 22 October 2014

Available online 1 November 2014

Keywords:

Child abuse

Aggression

Impulsivity

Smoking

Alcohol

Drug abuse

Suicidality

ABSTRACT

This study attempts to assess childhood maltreatment in prison through a hierarchical approach. The hierarchical approach principally aims to disentangle the independent effects of childhood maltreatment upon psychiatric morbidity/personality traits, if any, from the burden that the adverse family conditions have already imposed to the mental health of the maltreated individual-prisoner. To this direction, a conceptual framework with five hierarchical levels was constructed, namely: immutable demographic factors; family conditions; childhood maltreatment (physical abuse, neglect and sexual abuse); personality traits, habits and psychiatric morbidity; prison-related variables. A self-administered, anonymous set (battery) of questionnaires was administered to 173 male prisoners in the Chalkida prison, Greece; 26% of prisoners disclosed childhood maltreatment. Psychiatric condition in the family, parental alcoholism and parental divorce correlated with childhood maltreatment. After adjustment for immutable demographic factors and family conditions, childhood maltreatment was associated with aggression (both in terms of Lifetime History of Aggression and Buss–Perry Aggression Questionnaire scores), illicit substance use, personal history of psychiatric condition, current smoking, impulsivity and alcohol abuse. In conclusion, childhood maltreatment represents a pivotal, determining factor in the life course of male prisoners. Delinquents seem to suffer from long-term consequences of childhood maltreatment in terms of numerous mental health aspects.

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1. Introduction

Childhood maltreatment represents a major threat to the health of children throughout the world. Psychosocial sequelae of childhood abuse are highly variable (Teicher et al., 2009; Tyrka et al., 2009; Lang and Sharma-Patel, 2011); sexual and physical abuses may be considered more severe or pathogenic than emotional or verbal abuse (Briere and Elliott, 2003). However, this approach may not be fully informative because individual forms of maltreatment almost always co-occur and the effects of multiple types of maltreatment may well be synergistic (Dong et al., 2004; Teicher et al., 2009). Of note, childhood physical (Crime and Misconduct Commission Queensland 2007) as well as sexual maltreatment (Ogloff et al., 2012) represents risk factors for adult offending.

Compared to other countries, the reported incidence of child abuse in Greece has been reported as relatively low, according to the recent UNICEF report based on death rates (UNICEF, 2003), the Greek Emergency Department Injury Surveillance System (EDISS) (Petridou et al., 2001) and various research teams (Agathonos-Georgopoulou

and Browne, 1997). It is possible, however, that this rate is underestimated because of the lack of mandatory reporting of child abuse, as well as inadequate awareness among health care workers (Petridou et al., 2001). This makes it difficult to estimate the true extent of child abuse in Greece.

Prisoners are a specific population with a high prevalence of mental disorders, personality disorders and associated problems as substance and alcohol misuse, in Greece (Fotiadou et al., 2004, 2006) and worldwide (Fazel and Seewald, 2012); childhood maltreatment history is also particularly frequent among prisoners. Among them, history of childhood maltreatment has been associated with lifestyle habits and mental health aspects; associations with smoking (Papadodima et al., 2010), illicit substance use (Cuomo et al., 2008), depression (Roxburgh and Macarthur, 2014) self-injurious behavior (Sakelliadis et al., 2010) and aggression (Sarchiapone et al., 2009; Swogger et al., 2011) have been reported. A recent study highlighted associations between childhood abuse and nearly every type of psychiatric disorder in both genders (King et al., 2011). Studies have either relied upon interviews (Sarchiapone et al., 2009; Roxburgh and Macarthur, 2014) or self-report (Sakelliadis et al., 2010; Swogger et al., 2011).

From a methodological point of view, childhood maltreatment history in the prison is a rather challenging notion. Childhood maltreatment may be predicted by unfavorable familial conditions,

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such as parental alcoholism (Harter and Taylor, 2000; Xiao et al., 2008), parental divorce (Afifi et al., 2009), or possibly psychiatric conditions in the family, but may in turn act synergistically with them, modifying personality traits, such as aggression (Teicher, 2010; Allen, 2011), impulsivity (Roy, 2005), alcohol abuse (Lown et al., 2011), suicidality (Easton et al., 2013) as well as contributing to psychiatric morbidity. Childhood maltreatment seems thus inscribed into a network of intimately interwoven risk factors, whose dynamic interaction underlines the fact that a purely data-driven, multivariate stepwise approach may not describe adequately the phenomenon (Kraemer et al., 2001).

Integrating the aforementioned data that have appeared in the literature, we created a conceptual framework and a hierarchical statistical approach (Fonseca et al., 1996; Victora et al., 1997) was followed. Similarly to our previous publication in prisoners, where we focused hierarchically on smoking (Papadodima et al., 2010), the successive nature over time has been taken into account and five distinct levels were recognized in the conceptual framework, namely (i) immutable demographic factors, (ii) family conditions, (iii) maltreatment in childhood, (iv) personality traits and habits and psychiatric morbidity, and (v) prison-related variables (Fig. 1). Each level of parameters may well exert its effects upon all the following, “higher” levels. The hierarchical statistical approach included two steps: univariate analysis for the assessment of overall (unadjusted) effects and multivariate modeling, whose structure is dictated by the aforementioned conceptual framework.

The advantages of the hierarchical approach vis-à-vis the existing literature are numerous: it is based on a conceptual basis rather than entirely on statistical associations (the latter is the case of the commonly used stepwise multivariate analyses) and childhood maltreatment is globally assessed, being treated both as an outcome and as a predictor, depending on the level of other variables. Importantly, the hierarchical approach allows to disentangle between the overall (unadjusted) effects and the effects that are not mediated through the predictors of lower levels (Victora et al., 1997). This seems extremely meaningful in the case of the interplay between childhood maltreatment and psychiatric morbidity/personality traits, as one needs to discriminate between the independent effects of maltreatment per se, if any, and the burden that the adverse family conditions (corresponding to the lower hierarchical levels) have already imposed on the mental health of the maltreated individual-prisoner.

This study aims to assess childhood maltreatment in prison through a hierarchical approach. A variety of parameters are hierarchically evaluated with respect to maltreatment, so as to evaluate the role of the latter in the network of interconnected risk factors and personality traits of prisoners.

2. Methods

2.1. Participants

The Chalkida prison, where this survey was conducted, is a male remand and sentence prison located in Central Greece. A self-administered, anonymous set (battery) of questionnaires, taking between 20 and 30 min to complete, was administered to the entire population of prisoners, namely 173 subjects. The prisoners were informed in written on the introductory page of the questionnaire sets about: i. the duration and the potential burden of the completion, ii. the fact that their participation and answers to the survey will remain confidential, anonymous and will not modify the attitudes of staff/personnel and treatments to them in prison. Self-reported reasons of admission consisted of murder or serious injury (10.4%), theft or robbery (34.7%), fraud (23.2%), illegal drugs (23.2%) and other (8.5%), being comparable to the national admission data. The purpose of the study was thoroughly described and the voluntary nature of participation emphasized as part of the consent procedure. Written informed consent was obtained before the administration of the battery of questionnaires. Approval from the Ministry of Justice was obtained for the survey and the study was approved by the local Institutional Review Board.

The participants were also informed that they could stop their participation at any time and that there were no prison-related benefits or penalties for their participation. The prison doctor (E.I.S.) was responsible for the whole procedure, as well as for the maintenance of the confidentiality; at the time of the study, the prison doctor served as a primary health care physician therein and was trained by a psychiatrist with previous peer-reviewed publications on the field (mental health of prisoners) about all necessary steps for conducting this study. (O.G., acknowledged).

In case that a prisoner was not able to read and fill in the questionnaire himself (because he could not read Greek, being an illiterate or a foreigner without sufficient knowledge of the Greek language), the questionnaire was filled in by the prison doctor after a face-to-face interview (this was the case in seven interviews; all of them led to complete questionnaires, as per Section 2.3). Further details of the study have been published elsewhere (Sakellidis et al., 2010).

2.2. Questionnaire and measures

The battery of questionnaires included items on five hierarchical levels, namely: a) immutable sociodemographic features (age, nationality), b) family conditions (parental divorce, parental alcoholism and psychiatric condition in the family) in yes/no format, c) maltreatment in childhood (yes/no), d) personality traits, habits and psychiatric morbidity [educational attainment, aggression, impulsivity, suicidal ideation, current smoking habits (yes/no), alcohol abuse, illicit substance use (ever-use, yes/no item), history of diagnosed psychiatric condition (yes/no)] and v) prison-related parameters [duration of sentence, recidivism (previous sentence)].

Maltreatment in childhood was assessed by the following three yes/no items: “During childhood were you subjected to physical abuse?”, “During childhood were you subjected to parental neglect?” and “During childhood were you subjected to sexual abuse?”. An individual was considered maltreated when he responded ‘yes’ to at least one of these three items. Appropriate examples were given in written, accompanying the definitions (Child Welfare Information Gateway, 2008). Physical abuse was defined as any nonaccidental physical injury (ranging from minor bruises to severe fractures or death) as a result of punching, beating, kicking, biting, shaking, throwing, stabbing, choking, hitting (with a hand, stick, strap, or other object), burning, or otherwise harming a child. Neglect was defined as the failure of

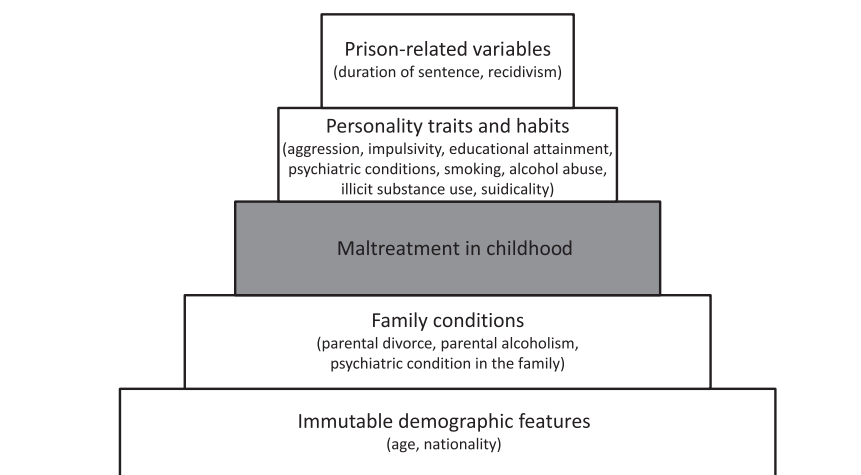


Fig. 1. The conceptual hierarchical framework of the study.

a parent or other person to provide for a child's needs; physical (e.g., failure to provide necessary food or shelter, or lack of appropriate supervision), medical (e.g., failure to provide necessary medical or mental health treatment), educational (e.g., failure to educate a child or attend to special education needs) and emotional (e.g., inattention to a child's emotional needs, failure to provide psychological care, or permitting the child to use alcohol or other drugs) were given as examples-axes of potential neglect. Sexual abuse included activities such as fondling a child's genitals, penetration, incest, rape, sodomy, indecent exposure and exploitation through prostitution or the production of pornographic materials (Child Welfare Information Gateway, 2008).

Alcohol abuse was assessed by using the CAGE questionnaire, a brief screening instrument containing four short questions (Mayfield et al., 1974; Ewing, 1984). CAGE score ranges between 0 and 4; CAGE has demonstrated high test-retest reliability (0.80–0.95) and adequate correlations (0.48–0.70) with other screening instruments. The CAGE questionnaire is a valid tool for detecting alcohol abuse and dependence, especially in medical and surgical inpatients, ambulatory medical patients and psychiatric inpatients (average sensitivity 0.71, specificity 0.90) (Dhalla and Kopec, 2007).

Hostility and aggression were evaluated by the Buss–Perry Aggression Questionnaire (BPAQ), a 29-item questionnaire containing brief statements to which a number ranging from 1 to 5 should be assigned (Buss and Perry, 1992). Retest reliability for the BPAQ over 9 weeks is also satisfactory (correlations ranged from 0.72 for anger to 0.80 for the total score (Buss and Perry, 1992). Construct validity for the Buss–Perry questionnaire is supported, to some extent, by its relative associations with other self-report measures of personality traits (Buss and Perry, 1992; Gallo and Smith, 1998).

The Brown–Goodwin Lifetime History of Aggression (LTHA) subsumes nine questions concerning aggression expressed towards others (by physical or verbal assault) and antisocial behaviors involving disciplinary action in school or work, with and without police contact. Each question was scored on a four-point scale; the interrater reliability is high ($r > 0.98$) (Brown et al., 1979). Internal consistency estimates have been shown excellent overall ($\alpha = 0.88$ for the informant version) (Dumais et al., 2005).

Impulsivity was assessed by using the Barratt Impulsivity Scale–BIS-11 (Patton et al., 1995), a 30-item scale with a four-point rating scale in each item (Patton et al., 1995). Patton et al. (1995) report internal consistency coefficients for the BIS-11 total score that range from 0.79 to 0.83 for separate populations of undergraduates, substance abuse patients, general psychiatric patients and prison inmates.

The Spectrum of Suicidal Behavior Scale (SSBS) is a five-level scale (1: non-suicidal behavior, 2: suicidal ideas, 3: suicidal threats, 4: mild suicide attempts, 5: serious suicide attempts) used to assess suicidal behavior on a continuum from no suicidal thoughts or behaviors to serious suicide attempts (Pfeffer et al., 1988). The SSBS was completed via self-report with reference to suicidality exhibited during the current incarceration. The SSBS has been shown to have high interrater reliability (Pfeffer et al., 1988). Self-injurious behavior was not included in the present analysis, as it has been thoroughly investigated in one previous report (Sakellidis et al., 2010).

2.3. Calculation of response rates

For the calculation of response rates, the American Association for Public Opinion Research Guidelines was adopted (The American Association for Public Opinion Research, 2008). Batteries of questionnaires with $> 80\%$ items completed were considered complete and those with 50–80% items filled in were characterized as partial responses; both complete and partial responses were suitable for further analysis. On the contrary, questionnaires with less than 50% of items completed were considered break-offs and were consequently not included in the subsequent analysis. Maltreatment was set as the main study variable; as a result, the three items concerning childhood maltreatment (i.e. physical abuse, parental neglect and sexual abuse) were set as *crucial questions*. In case none or solely one of them was filled in, the case was considered break-off and was not included in the subsequent analysis, whereas answer to two of the three items was considered partial response and was included in the analysis.

2.4. Statistical analysis—construction of the hierarchical model

To ensure comparability of odds ratios (ORs) and to overcome dependence on the unit-scale of the independent variables, all possible risk factors were converted to binary variables, as appropriate (Fonseca et al., 1996). Continuous variables were converted as follows; 0: $<$ median value, 1: \geq median value). Low educational attainment was defined as being analphabetic or having finished solely the primary school (vs. secondary-high school and university). Similarly to our previous hierarchical approach (Papadodima et al., 2010), the hierarchical approach comprised two steps.

First, univariate analysis was performed to evaluate the associations between all examined parameters and childhood maltreatment. Unadjusted odds ratios (ORs) together with their 95% Confidence Intervals (CIs) were estimated through univariate logistic regression. Of note, univariate ORs are not modified by the

mutual replacement performed when setting the dependent variable as an independent one, and vice versa.

Second, multivariate hierarchical approach followed. Each variable in the conceptual framework had to be adjusted for the variables in the precedent level of the framework (Fig. 1). As a result, the position of maltreatment (dependent or independent variable) was determined by the level of the examined parameters. For instance, the logistic regression model examining the association between maltreatment and parental alcoholism had the form:

$$\text{logit}(\text{maltreatment}) = a + b_1^*(\text{parental alcoholism}) + b_2^*(\text{younger age}).$$

On the other hand, the multivariate model examining the association e.g., between illicit substance use and maltreatment was described by the equation:

$$\text{logit}(\text{illicit substance use}) = a + b_1^*(\text{maltreatment}) + b_2^*(\text{parental alcoholism}) + b_3^*(\text{psychiatric condition in the family}) + b_4^*(\text{parental divorce}) + b_5^*(\text{younger age})$$

P-values and McFadden's pseudo- R^2 values were provided regarding all fitted models. Of note, McFadden's pseudo- R^2 between 0.2 and 0.4 denotes excellent model fit (McFadden, 1974). Statistical analysis was performed with STATA/SE 13 statistical software (Stata Corporation, College Station, TX, USA).

3. Results

Among the 173 prisoners, no refusals to participate were noted; nevertheless, regarding the completeness of response to sets/batteries of questionnaires, 19 break-offs occurred (nine cases answered to $< 50\%$ of questions and 10 cases filled in less than two out of three crucial questions), resulting in a response rate equal to 154/173 (89.0%); as mentioned above, the analysis was based on the 154 sets of questionnaires.

40 out of 154 participants (26.0%, 95% CI: 19.2–33.6%) disclosed maltreatment in childhood. Specifically, physical abuse predominated, as it was reported by 29/38 maltreated individuals (76.3%, 95% CI: 59.8–88.6%, two out of 40 were partial responders not having filled in this item). Parental neglect was reported by 28/40 maltreated individuals (70.0%, 95% CI: 53.5–83.4%), whereas sexual abuse was disclosed by 2/39 maltreated subjects (5.0%, 95% CI: 0.6–16.9%, one partial responder did not fill in this item). Physical abuse and parental neglect correlated well with each other in the total sample ($\chi^2(1) = 39.59, p < 0.001$).

Table 1 presents the examined parameters in the study sample ($n = 154$). The unadjusted, crude ORs with their 95% CIs, together with the underlying summary statistics, are graphically illustrated in Fig. 2. In descending order, childhood maltreatment was associated with aggression (in terms of LTHA score), psychiatric condition in the family, illicit substance use, parental alcoholism, aggression (as measured by BPAQ score), personal history of psychiatric condition, parental divorce, current smoking in prison, recidivism, impulsivity and alcohol

Table 1

Description of the study sample ($n = 154$); all variables were self-reported.

Categorical variables	N (%)
Maltreatment in childhood	40 (26.0)
Low educational attainment	34 (23.4)
Non-Greek nationality	8 (5.2)
Parental divorce	33 (21.5)
Parental alcoholism	20 (13.1)
Psychiatric condition in the family	13 (8.5)
Diagnosed psychiatric condition	37 (26.2)
Illicit substance use	57 (42.9)
Current smoking	109 (79.6)
Recidivism	51 (43.5)
Continuous variables	Mean \pm S.D. (median)
Age (years)	41.9 \pm 12.7 (42)
BPAQ (score)	72.0 \pm 22.2 (73)
BIS-11 (score)	62.0 \pm 14.9 (59)
CAGE (score)	1.15 \pm 1.19 (1)
LTHA (score)	4.49 \pm 5.54 (2)
SSBS (score)	2.09 \pm 1.69 (2)
Duration of sentence (years)	16.1 \pm 21.6 (10)

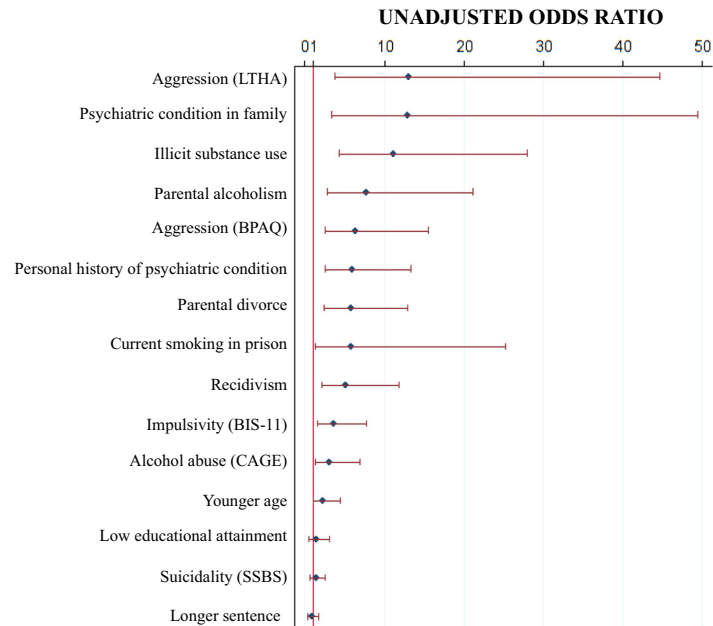


Fig. 2. Plot showing unadjusted odds ratios (OR), as well as 95% confidence intervals (CI), describing the associations between the examined parameters and childhood maltreatment for prisoners.

Table 2

Results of the hierarchical approach regarding the lower two levels of the hierarchical model, where childhood maltreatment was set as the *dependent variable*. ORs describe the associations between the examined parameters and childhood maltreatment; all variables were self-reported.

Examined parameters	Summary statistics ^a	Unadjusted model			Adjusted model		
		OR (95% CI)	p-value	Pseudo-R ²	OR (95% CI)	p-value	Pseudo-R ²
Immutable demographic features							
Younger age	63.2% vs. 45.1%	2.08 (0.98–4.44) ^b	0.057	0.022	Not applicable		
Non-Greek nationality	0% vs. 7.0%	Not estimable			Not applicable		
Family conditions							
Psychiatric condition in the family	25.6% vs. 2.6%	12.76 (3.30–49.38)	< 0.001	0.097	14.67 (3.64–59.03) ^c	< 0.001	0.132
Parental alcoholism	33.3% vs. 6.1%	7.64 (2.77–21.07)	< 0.001	0.094	7.22 (2.56–20.36) ^c	< 0.001	0.114
Parental divorce	46.2% vs. 13.2%	5.66 (2.46–12.99)	< 0.001	0.098	4.98 (2.11–11.77) ^c	< 0.001	0.107

^a % Prevalence of the parameters among the 40 maltreated vs. the 114 non-maltreated subjects.

^b Only unadjusted OR is provided, as this variable belongs to the first level of the hierarchical model.

^c Adjusted for younger age.

abuse. The associations with childhood maltreatment were not significant for younger age, low educational attainment, suicidality and duration of sentence. Of note, the OR for non-Greek nationality was not estimable, as a zero cell occurred (i.e., all prisoners of non-Greek nationality were free of history for childhood maltreatment); as a result, non-Greek nationality could not be further analyzed in the hierarchical model.

The results of the multivariate hierarchical approach are shown in Tables 2 and 3. Psychiatric condition in the family, parental alcoholism and parental divorce correlated with childhood maltreatment, after adjustment for age (Table 2). Interestingly, childhood maltreatment was associated with more pronounced aggression (both in terms of LTHA and BPAQ scores), illicit substance use, personal history of psychiatric condition, current smoking, impulsivity and alcohol abuse, even after adjustment for all variables of the hierarchically lower levels (i.e., younger age, parental divorce, parental alcoholism and psychiatric condition in the family) (Table 3). The null univariate associations between maltreatment and educational attainment, as well as suicidality, were reproducible at the multivariate approach.

Regarding prison-related parameters, multivariate adjustment for all personality traits led to the disappearance of the univariate positive association between recidivism and childhood

maltreatment; similar results were essentially obtained when aggression was expressed either as LTHA score (adjusted OR=2.47, 95% CI: 0.45–13.38, Table 3) or as BPAQ score (adjusted OR=2.12, 95% CI: 0.43–10.35) during the adjustment process. Regarding model fit, reflected upon McFadden's pseudo-R² values, the models pertaining to the higher hierarchical levels (Table 3) rather expectedly performed better, given the fact that they summarized a larger number of statistically significant associations.

4. Discussion

The present study portrays childhood maltreatment as a pivotal, determining factor in the life course of male prisoners. Stemming from unfavorable family conditions, childhood maltreatment may per se impose significant burden regarding numerous aspects, among which the present model enumerated aggression, impulsivity, illicit substance use, psychiatric conditions, alcohol abuse or even smoking.

Regarding the prevalence of child maltreatment history among the prisoners of our sample (26%), it seems relatively lower than that reported in other studies. For example, when the 28-item

Table 3
Results of the hierarchical approach regarding the upper two levels of the hierarchical model, where childhood maltreatment was set as an *independent variable*. ORs describe the associations between the examined parameters and childhood maltreatment; all variables were self-reported.

Examined parameters	Summary statistics ^a	Unadjusted model			Adjusted model		
		OR (95% CI)	<i>p</i>	Pseudo-R ²	OR (95% CI)	<i>p</i>	Pseudo-R ²
Education, personality traits and habits							
Aggression (LTHA score \geq median)	91.4% vs. 45.3%	12.89 (3.72–44.70)	< 0.001	0.137	10.32 (2.51–42.38) ^b	0.001	0.253
Illicit substance use	81.1% vs. 28.1%	10.95 (4.30–27.91)	< 0.001	0.174	7.98 (2.16–29.43) ^b	0.002	0.348
Aggression (BPAQ score \geq median)	81.1% vs. 40.6%	6.28 (2.53–15.59)	< 0.001	0.097	6.07 (1.98–18.56) ^b	0.002	0.187
Personal history of psychiatric condition	54.3% vs. 17.0%	5.81 (2.52–13.40)	< 0.001	0.108	2.83 (1.02–7.89) ^b	0.047	0.211
Current smoking	94.3% vs. 74.5%	5.64 (1.27–25.18)	0.023	0.055	6.48 (0.78–53.98) ^b	0.084	0.067
Impulsivity (BIS-11 score \geq median)	73.7% vs. 44.9%	3.44 (1.52–7.79)	0.003	0.048	2.01 (0.79–5.14) ^b	0.146	0.090
Alcohol abuse (CAGE score \geq median)	80.0% vs. 57.5%	2.95 (1.25–6.98)	0.014	0.034	3.21 (1.08–9.53) ^b	0.035	0.075
Low educational attainment	27.0% vs. 22.2%	1.30 (0.55–3.05)	0.552	0.002	0.45 (0.12–1.65) ^b	0.229	0.081
Suicidality (SSBS score \geq median)	56.4% vs. 50.9%	1.25 (0.60–2.60)	0.553	0.002	1.08 (0.45–2.61) ^b	0.862	0.019
Prison-related parameters							
Recidivism	70.6% vs. 32.5%	4.98 (2.09–11.87)	< 0.001	0.090	2.47 (0.45–13.38) ^c	0.295	0.401
Duration of sentence (\geq median)	50.0% vs. 55.6%	0.80 (0.37–1.72)	0.567	0.002	1.29 (0.28–5.99) ^c	0.741	0.141

^a % Prevalence of the parameters among the 40 maltreated vs. the 114 non-maltreated subjects.

^b Adjusted for younger age, parental divorce, parental alcoholism and psychiatric condition in the family.

^c Adjusted for younger age, parental divorce, parental alcoholism, psychiatric condition in the family, aggression (LTHA score \geq median), illicit substance use, personal history of psychiatric condition, current smoking, impulsivity, alcohol abuse, low educational attainment, suicidality.

version of the Childhood Trauma Questionnaire (CTQ) was administered to a mixed gender group of 136 prisoners, at least one type of moderate or severe childhood trauma was found in 50.4% of the prisoners (Driessen et al., 2006). In their recent study, King et al. (2011) concluded that childhood maltreatment was common among detained youths, with more than three-quarters of females and more than two-thirds of males having a history of physical abuse, whereas more than 40% of females and 10% of males reported a history of sexual abuse. A similarly high level of childhood adversity among prisoners was also reported by Godet-Mardirossian et al. (2011). The lower prevalence of childhood maltreatment in our sample can be inscribed in the context of Greece as a whole, where the reported childhood maltreatment rates are relatively low (UNICEF, 2003).

The origins of childhood abuse in our examined population of prisoners seem to be in line with those supported by other studies, on general or specific populations. Parental alcoholism represents a rather well recognized risk factor for child abuse worldwide (Harter and Taylor, 2000; Xiao et al., 2008). Of note, a diagnosed psychiatric condition in the family was independently associated with childhood maltreatment. In line with our observation pointing to nearly five-fold increased risk for maltreatment among prisoners experiencing parental divorce, a study on the U.S. general population pointed to a nearly two-fold increase in the risk for child abuse in offspring of divorced parents (Afifi et al., 2009). The even more sizeable odds ratios in our sample may reflect the poor socioeconomic conditions in prisoners' families, which further inflate and aggravate the aforementioned causal links, compared to measurements in the general population.

Even after adjustment for the triad of unfavorable family conditions, childhood maltreatment was capable of conferring sizeable excess risk for aggression and impulsivity. Our study can thus be inscribed into the wider context of studies supporting the association between childhood abuse and subsequent adult aggression (Teicher, 2010; Allen, 2011) in the general population, which has become also evident among criminal offenders (Sarchiapone et al., 2009; Swogger et al., 2011). Similarly, Roy (2005) detected a direct association between impulsivity and childhood trauma on the special population of 268 abstinent drug dependent patients. Different researchers argue that early traumatization has a negative influence on the development of the ability of offenders to regulate anger and affect (Krischer and Sevecke, 2008). Accordingly, in the field of self-injurious behavior,

the literature repeatedly mentions childhood history of physical or sexual abuse as a potential casual or risk factor, as evidenced by studies in prisoners (Sakelliadis et al., 2010), inpatients in psychiatric hospitals (Kaess et al., 2013) as well as the general population (Asgeirsdottir et al., 2011).

There is a possibility that impulsivity and aggression may be an inherited trait underlying both childhood abuse (perhaps at the hands of a first-degree relative with trait impulsivity and aggression) as well as the manifestation of adult trait impulsivity (Roberts and Hawton, 1980; Kaplan et al., 1983). For example, there is evidence from nonhuman primate studies (Higley et al., 1993) that both genetic transmission as well as environmental factors such as maternal deprivation may contribute to the presence of biological correlates of impulsivity. Aggression and impulsivity, consequently, may be an inherited trait that is worsened by environmental experiences of abuse.

In our sample, childhood maltreatment independently correlated with illicit substance use, alcohol abuse and increased risk for current smoking. Regarding substance abuse, our study is in line with another recent study on Italian prisoners, pointing to the importance of early life trauma history in illicit substance use (Cuomo et al., 2008). With respect to alcohol use, our study underlines the already recognized vicious circle between alcohol abuse and childhood maltreatment (Widom and Hiller-Sturmhofel, 2001); as described above, parental alcoholism is a causal factor marking an early family environment where child abuse fosters, whereas studies in the general population underlined that the child abuse generates once again alcohol dependence during lifetime (Lown et al., 2011). As far as smoking is concerned, the present hierarchical approach is in line with our previous work on the same population, which pointed to childhood maltreatment as an independent and robust risk factor for smoking in prison (Papadodima et al., 2010).

Childhood maltreatment was independently associated with self-reported diagnosed psychiatric condition among prisoners. This finding seems of special significance, given that a well designed systematic review has pointed that prisoners are in particularly high risk for mental disorders (Fazel and Seewald, 2012). There seems to be a general consensus in the literature that child maltreatment can result in long-term mental health problems (Bandelow et al., 2005). Patients with personality disorders report increased rates of childhood maltreatment across a range of abuse types, such as emotional abuse, physical abuse, and neglect

(Bierer et al., 2003; Battle et al., 2004). Dissociative disorders and post-traumatic stress disorder are also associated with childhood trauma; they are also highly represented in the prison population (Lewis et al., 1997; Akyuz et al., 2007). Especially among prisoners, axis I and axis II disorders have been significantly associated with childhood trauma, at a dose–response relationship (Driessen et al., 2006). Marshall and Cooke (1999) have underlined the importance of familial and societal experiences in the prediction of adult psychopathy scores among prisoners; Campbell et al. (2004) have extrapolated the association between childhood maltreatment and psychopathic traits among incarcerated adolescent offenders.

Despite a positive link between recidivism and childhood maltreatment at the univariate analysis, the multivariate hierarchical model pointed to null associations between childhood maltreatment and prison-related parameters i.e., duration of sentence and recidivism. It seems therefore that other life events and personality traits may principally account for prison- and crime-related behaviors, leaving childhood maltreatment in the background. Moreover, the null association between the age of subjects and childhood maltreatment may reflect the steadily low rates of the latter in the Greek society (UNICEF, 2003) spanning the whole respective time period. Although childhood maltreatment represents an acknowledged risk factor for suicidality among male (Mandelli et al., 2011) and female (Clements-Nolle et al., 2009) prisoners, the lack of association in our sample may be attributed to the minimal degree of levels-scales (five-scale) in the instrument employed in our survey (Pfeffer et al., 1988), which may have hampered the statistical power of our approach.

Despite its original findings, this study has some limitations that have to be taken into account. First, we used a retrospective measure of childhood experiences that may be subject to recall bias, despite the extensive list of examples that the participants were provided with; data on abuse experiences were not validated by interview or observational data. The yes/no questions pertaining to maltreatment inherently did not yield a standardized score; as a result, more elaborate tools, such as the Childhood Trauma Questionnaire (Bernstein et al., 1994) or the Comprehensive Child Maltreatment Scale (Higgins and McCabe, 2001) would be desirable for the extrapolation and validation of our findings. Second, we did not account for variability in severity or chronicity of maltreatment experiences (Roosa et al., 1998). Moreover, the present sample was limited with respect to the number of participants reporting sexual abuse, the latter being possibly a stronger individual predictor of symptoms of post-traumatic stress and other psychological sequelae (Briere and Elliott, 2003). Consequently, we did not examine several forms (Teicher et al., 2006) of abuse individually, especially given that our study focused only on three possible types of maltreatment (physical abuse; neglect; sexual abuse). Furthermore, given the cross-sectional study design, “reverse causation” may not be ruled out; for instance, instead of the abuse leading to psychiatric conditions, one could support that participants with certain psychiatric conditions may endorse an abuse item differently.

Regarding the hierarchical procedure, the median values of the sample were uniformly adopted as cut-off values to minimize allocation bias (Papadodima et al., 2010); nevertheless these values may well differ from general population rates. Similarly to previously published studies (Fonseca et al., 1996; Papadodima et al., 2010), no correction for multiple comparisons was undertaken, as the hierarchical approach represents a compendium of alternative, *a priori* designed multivariate models rather than *post-hoc* simultaneous testing of differences between various groups. Moreover, psychiatric examination at an individual basis would be desirable, so as to specifically elucidate which conditions specifically underlie the self-reported psychiatric condition. In addition, the fact the doctor of the prison filled in the questionnaires for those patients who could not read may have been a source of bias

for those subjects (Sakellidis et al., 2010). However, only seven questionnaires were filled in by the prison doctor; the small number of such cases precluded the performance of statistical tests to quantify this source of bias, but the latter seems rather minimal, affecting only a small subgroup. Furthermore, the self-report of prison-related parameters, may have also introduced bias, as searches in prison records would represent the gold standard; nevertheless, the records were not available for review in our study.

Another aspect that may merit discussion pertains to the fact that no approached offenders declined to participate (take the questionnaire); one may assume that the prisoners felt coerced into participating due to the apparent fact that the prison doctor was recruiting participants. Nevertheless, it should be stressed that the participants were informed that they could stop their participation at any time and that there were no prison-related benefits or penalties for their participation. Therefore, despite taking the questionnaires, 19 break-offs occurred, resulting in a final response rate equal to 89.0%, which seems rather acceptable.

Regarding the external generalizability of findings, it should be kept in mind that the study was performed only in the entire population of one prison; nevertheless, the reasons of admission were comparable to the national admission data. Moreover, the average sentence might appear as a rather long period relative to other studies in the literature; however, this corresponded to the initial conviction which is subsequently reduced in most cases due to good conduct and/or social work.

In conclusion, childhood maltreatment seems to be a marking experience in the life course of male prisoners. Despite their coexisting and mutually associated unfavorable life events, prisoners seem to suffer from the consequences of childhood maltreatment in terms of numerous mental health aspects.

Conflict of interest

None.

Acknowledgment

The authors would like to thank Dr. Orestis Giotakos for providing the prison doctor with training regarding all necessary steps in conducting this study.

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