ARTICLE IN PRESS

Journal of Affective Disorders xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Corrigendum

Corrigendum to ``Violent criminal behavior in the context of bipolar disorder: Systematic review and meta-analysis" [Journal of Affective Disorders (2018) 239:161–170]

Norma Verdolini[a,b,c,d], Isabella Pacchiarotti[a,c], Cristiano A. Köhler[e], Maria Reinares[a,c], Ludovic Samalin[a,f,g], Francesc Colom[c,h], Alfonso Tortorella[d], Brendon Stubbs[i,j], André F. Carvalho[k,l], Eduard Vieta[a,c,*], Andrea Murru[a,c]

[a] Bipolar Disorder Unit, Institute of Neuroscience, Hospital Clinic, University of Barcelona, IDIBAPS, CIBERSAM, 170 Villarroel st, 12-0, 08036, Barcelona, Catalonia, Spain
[b] FIDMAG Germanes Hospitalàries Research Foundation, c/ Dr. Pujades 38, 08830, Sant Boi de Llobregat, Barcelona, Catalonia, Spain
[c] CIBERSAM, Centro Investigación Biomédica en Red Salud Mental, Barcelona, Spain
[d] Division of Psychiatry, Clinical Psychology and Rehabilitation, Department of Medicine, Santa Maria della Misericordia Hospital, University of Perugia, Ellisse Building, 8th Floor, Sant'Andrea delle Fratte, 06132, Perugia, Italy
[e] Translational Psychiatry Research Group and Department of Clinical Medicine, Faculty of Medicine, Federal University of Ceará, Fortaleza, CE, Brazil
[f] CHU Clermont-Ferrand, Department of Psychiatry, EA 7280, University of Auvergne, 58, Rue Montalembert, 63000, Clermont-Ferrand, France
[g] Fondation FondaMental, Hôpital Albert Chenevier, Pôle de Psychiatrie, 40 rue de Mesly, 94000, Créteil, France
[h] Mental Health Group, IMIM Hospital del Mar, CIBERSAM, Plaza Charles Darwin, sn, 08003 Barcelona, Catalonia, Spain
[i] Physiotherapy Department, South London and Maudsley NHS Foundation Trust, Denmark Hill, London SE5 8AZ, UK
[j] Health Service and Population Research Department, Institute of Psychiatry, Psychology and Neuroscience (IoPPN), King's College London, London, United Kingdom
[k] Department of Psychiatry, University of Toronto, Toronto, ON, Canada
[l] Centre of Addiction and Mental Health (CAMH), Toronto, ON, Canada

The authors regret that an error occurred in reporting the number of individuals who presented violent criminal behaviors in the general population sample of the article by Webb and colleagues (Webb et al., 2014). As a consequence, statistical analyses have been re-run and results changed accordingly.

Since the study by Fazel and colleagues (Fazel et al., 2007) is a study of a selected subgroup of violent offenders, namely those with sexual offences, we decided not to include it in the new analyses as it might lead to a count of 0 for violent crimes in the control group and a following biased odds ratio.

The following changes in the text have been done.

1. In the section **2.5 Statistical Analysis**, the sentence "When evidence of publication bias was observed, ES estimates were adjusted with the trim-and-fill procedure (Fazel et al., 2007)" has been eliminated.

2. The correct text for the section **3. Results** is:

"The database search generated 1,031 hits, 46 articles were identified after searching the references of included articles. After duplicates removal, the title/abstracts of 773 references were screened for eligibility; of those, 682 were excluded. Full-texts of 91 references were scrutinized in detail for eligibility, with 80 excluded (see Table S1 in the supplementary material for reasons), and 11 references included for systematic review and meta-analysis (see flowchart in Fig. 1, characteristics in Table S2). Overall, data from 9,505,095 participants (56,023 patients with BD, 9,233,772 general population controls and 215,300 patients with any psychiatric disorder) were included. Participants presenting any VCB were 91,545. Studies have followed cross-sectional (k = 4), case-control (k = 2), or prospective (k = 5) designs. The mean % of criteria met in the NOS scale across studies was 81.8 (SD = 18.1) (Table S3). A half of the included studies had a poor methodological quality. Nine out of eleven of the included studies used representative samples and only four specified in the methodology a diagnostic assessment with a structured interview.

3.1. Violent criminal behavior in bipolar disorder

The prevalence of VCB in individuals with BD was 7.7% (95% CI = 5.0–11.5; k = 4; Table 1). Heterogeneity was large (I^2 = 54.7%) and not significant (Q = 6.63, P = .085, df = 3). No evidence of publication bias was observed (P = .941; Egger's test) (funnel plot in Figure S1).

The association of BD and VCB compared to general population was significant (OR = 3.320; 95% CI = 2.568–4.293; k = 11; P < .001;

DOI of original article: https://doi.org/10.1016/j.jad.2018.06.050
* Corresponding author.
E-mail address: EVIETA@clinic.cat (E. Vieta).

https://doi.org/10.1016/j.jad.2019.10.022

0165-0327/ Crown Copyright © 2019 Published by Elsevier B.V. All rights reserved.

Please cite this article as: Norma Verdolini, et al., Journal of Affective Disorders, https://doi.org/10.1016/j.jad.2019.10.022

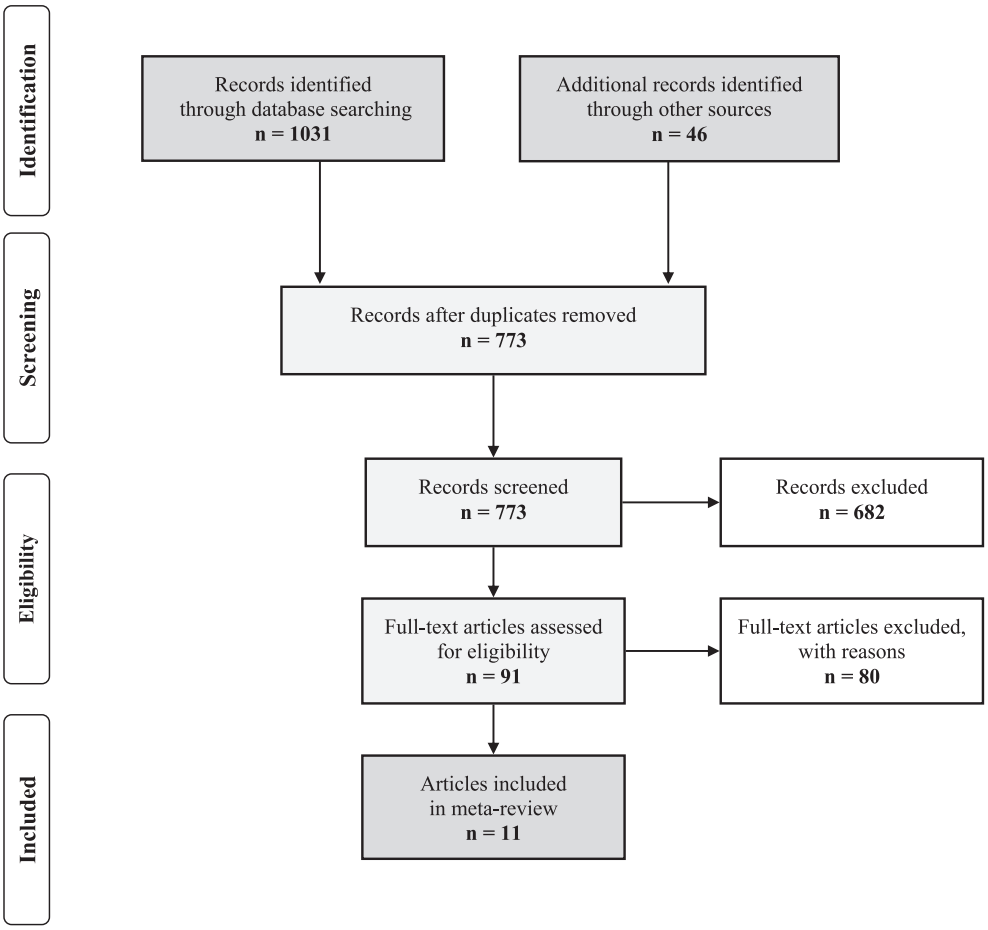

Fig. 1. PRISMA flowchart of study selection for systematic review and meta-analysis.

Table 1
Prevalence of criminal behavior in individuals with bipolar disorder. Data from four cross-sectional studies. Sources of heterogeneity were explored through subgroup and meta-regression analyses.

Subgroup	N studies	BD Prevalence			Heterogeneity		
		%	95% CI		I^2	Q	P-value
Overall	4	7.66	5.01	11.53	54.7	6.63	.085
Crime report type							
Self-report	3	7.53	3.30	16.26	69.8	6.63	**.036**
Geographic region							
US	3	7.53	3.30	16.26	69.8	6.63	**.036**

Moderator	N studies	Meta-regression				Meta-regression		
		Slope	95% CI		P-value	Intercept	z	P-value
% Newcastle-Ottawa Scale score	4	−0.033	−0.058	−0.008	**.010**	−0.019	−0.020	.984
Publication year	4	−0.018	−0.095	0.058	.639	34.377	0.438	.661

Abbreviations: BD = bipolar disorder; CI = confidence interval.

Table 2, Fig. 2). Between-study heterogeneity was very large (I^2 = 93.4%) and significant (Q = 152.65, P < .001, df = 10). No evidence of publication bias was verified (P = .302; Egger's test) (funnel plot in Figure S2). The association between BD and VCB was significant in cross-sectional (k = 4) and retrospective cohort (k = 5) studies (Table 2, Fig. 2). The chance of VCB in BD was significantly lower in retrospective cohort (OR = 2.819) than cross-sectional studies (OR = 4.562). Moreover, the association was significantly higher if VCB was assessed through self-reported measures (OR = 4.034) than based on records (OR = 3.197). BD was also associated with VCB only in studies conducted in the USA or EU (Table 2). In meta-regression analyses, no significant moderators emerged (Table 2).

The association between BD and VCB compared to controls with any psychiatric disorder was not significant (OR = 0.684; 95% CI = 0.437–1.071; k = 8; P = 0.096; Table 3, Fig. 3). Between-study heterogeneity was very large (I^2 = 84.9%) and significant (Q = 46.37, P = < .001, df = 7). No evidence of publication bias was verified (P = .246; Egger's test) (funnel plot in Figure S4). The association between BD and VCB was significant only in studies where VCB was assessed from records (Table 3). In meta-regression analyses, no significant moderators emerged (Table 3).

Six studies investigated VCB in BD patients compared to controls

ARTICLE IN PRESS

Table 2
Association of bipolar disorder and criminal behavior in comparison to general population controls. Sources of heterogeneity were explored through subgroup and meta-regression analyses.

Subgroup	N studies	Meta-analysis				Heterogeneity		
		OR	95% CI		P-value	I^2	Q	P-value
Overall	11	3.320	2.568	4.293	< **.001**	93.4	152.65	< **.001**
Crime-report type								
Self-report	4	4.034	1.712	9.505	**.001**	81.4	16.10	**.001**
Record-based	7	3.197	2.389	4.278	< **.001**	95.5	134.60	< **.001**
Study design								
Retrospective cohort	5	2.819	1.643	4.836	< **.001**	97.0	134.96	< **.001**
Cross-sectional	4	4.562	3.038	6.850	< **.001**	38.8	4.90	.179
Geographic region								
US	4	4.034	1.712	9.505	**.001**	81.4	16.10	**.001**
EU	4	3.143	2.250	4.390	< **.001**	97.6	123.77	< **.001**
Oceania	3	2.753	0.785	9.658	.114	77.6	8.92	**.012**

Moderator	N studies	Meta-regression				Meta-regression		
		Slope	95% CI		P-value	Intercept	z	P-value
% Newcastle-Ottawa Scale score	11	−0.005	−0.028	0.018	.670	1.615	1.661	.097
Publication year	11	0.003	−0.055	0.061	.920	−4.819	−0.081	.936
% Any substance use disorder	5	−0.044	−0.116	0.029	.240	1.234	3.824	< **.001**

Abbreviations: BD = bipolar disorder; CI = confidence interval; NOS = not otherwise specified.

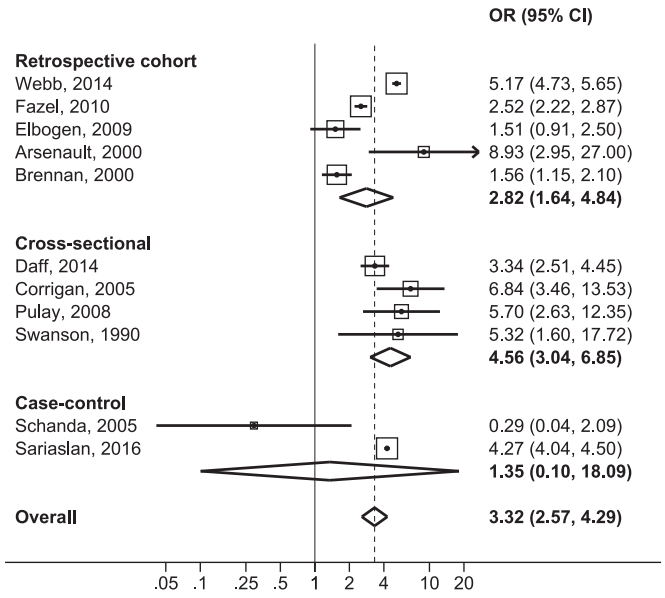

Fig. 2. Forest plot of the association of violent criminal behavior in BD subjects in comparison to the general population. Subgroup estimates are provided in accordance to study design. Effect sizes are reported as OR and 95% CIs. The sizes of the squares are proportional to sample sizes, and diamonds depict pooled effect size estimates through random-effects modeling.

with major depressive disorder (MDD) (N = 134,366), finding a significant association (OR = 1.804; 95% CI = 1.278–2.546; k = 6; P = 0.001; Figure S6 and Table S4). There was no heterogeneity (I^2 = 0.0%; Q = 4.68, P = 0.457, df = 5), and no evidence of publication bias (P = .161, Egger's test) (funnel plot in Figure S7). In subgroup analyses, the association was significant and without heterogeneity in studies that used a self-report for VCB or were conducted in the USA, and significant and with small heterogeneity in studies that used a cross-sectional design (Table S4). No moderators were significant in meta-regression analyses (Table S5).

Seven studies investigated VCB in BD patients compared to controls with psychotic disorders (N = 54,658). Individuals suffering from BD had a smaller chance of VCB (OR = 0.433; 95% CI = 0.282–0.666; k = 7; P = < .001; Figure S8, Table S4). Heterogeneity was large (I^2 = 69.8%) and significant (Q = 19.84, P = 0.003, df = 6). No evidence of publication bias was observed (P = .822; Egger's test) (funnel plot in Figure S9). Subgroup analyses showed that the association was maintained in studies using a record-based assessment for VCB, or retrospective cohort design (Table S4). No moderators were significant in meta-regression analyses (Table S5).

Four studies investigated VCB in BD patients compared to controls with anxiety (N = 5,784). The association was not significant (OR = 2.514; 95% CI = 1.615–3.914; k = 4; P < .001; Figure S10 and Table S4). There was no heterogeneity (I^2 = 0.0%; Q = 0.75, P = .860, df = 3) and no evidence of publication bias was observed (P = .290; Egger's test) (funnel plot in Figure S11). Subgroup analyses showed a significant association (OR = 2.511) for 3 studies that used cross-sectional design, a self-report instrument and were conducted in the USA. Meta-regression analyses were not performed since less than five independent datasets were available for each moderator.

Four studies investigated VCB in BD patients compared to controls with alcohol abuse/dependence disorders (N = 4,801). The association was not significant (OR = 0.304; 95% CI = 0.047–1.978; k = 4; P = .213; Figure S12, Table S4). Heterogeneity was very large (I^2 = 93.8%) and significant (Q = 48.00, P < .001, df = 3). No evidence of publication bias was observed (P = .645; Egger's test) (funnel plot in Figure S13).

Five studies investigated VCB in BD patients compared to controls with drug abuse/dependence disorders (SUD) (N = 16,601). The association was not significant (OR = 0.746; 95% CI = 0.537–1.037; k = 5; P = .081; Figure S14, Table S4). There was no heterogeneity (I^2 = 0.0; Q = 3.19, P = .527, df = 4) and no evidence of publication bias was observed (P = .302; Egger's test) (funnel plot in Figure S15).

Only one study investigated VCB in BD patients compared to controls with personality disorders (N = 1,054) (Pulay et al., 2008). The association was not significant (OR = 1.102; 95% CI = 0.482–2.517; P = .818)."

3. As a consequence, the section 4. Discussion will change accordingly since "bipolar disorder was significantly associated with an almost 3-fold increased risk of violent criminal behaviors in comparison to general population controls".

4. Finally, the correct affiliation of Prof. Alfonso Tortorella is [d](Division of Psychiatry, Clinical Psychology and Rehabilitation, Department of Medicine, Santa Maria della Misericordia Hospital, University of Perugia, Ellisse Building, 8th Floor, Sant'Andrea delle Fratte, 06132, Perugia, Italy) and not [b](FIDMAG Germanes

Table 3
Association of bipolar disorder and criminal behavior in comparison to controls with any psychiatric disorder. Sources of heterogeneity were explored through subgroup and meta-regression analyses.

Subgroup	N studies	Meta-analysis				Heterogeneity		
		OR	95% CI		P-value	I^2	Q	P-value
Overall	8	0.684	0.437	1.071	.096	84.9	46.37	< **.001**
Crime-report type								
Self-report	4	1.098	0.783	1.540	.588	0.0	1.85	.603
Record-based	4	0.419	0.249	0.706	**.001**	82.2	16.83	**.001**
Study design								
Retrospective cohort	3	0.693	0.238	2.020	.502	91.2	22.82	< **.001**
Cross-sectional	3	1.268	0.806	1.995	.304	0.0	0.98	.613
Geographic region								
US	4	1.098	0.783	1.540	.588	0.0	1.85	.603

Moderator	N studies	Meta-regression				Meta-regression		
		Slope	95% CI		P-value	Intercept	z	P-value
% Newcastle-Ottawa Scale score	8	0.004	−0.026	0.035	.785	−0.718	−0.543	.587
Publication year	8	−0.007	−0.088	0.074	.858	14.443	0.174	.862

Abbreviations: BD = bipolar disorder; CI = confidence interval; NOS = not otherwise specified.

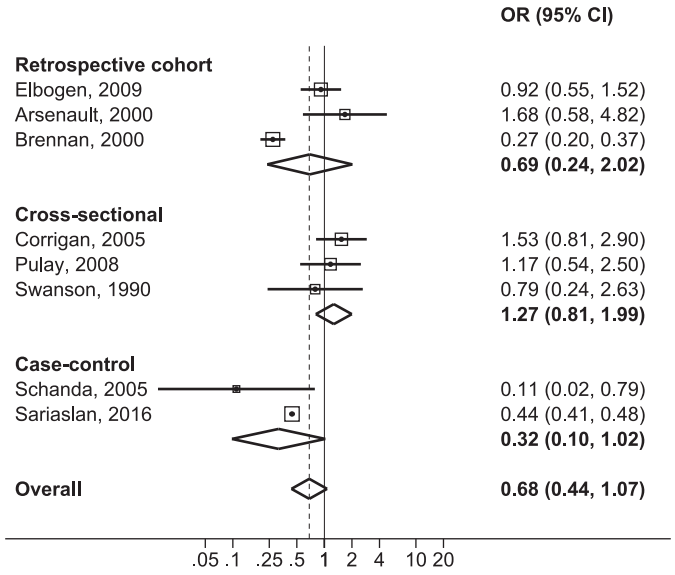

Fig. 3. Forest plot of the association of violent criminal behavior in BD subjects in comparison to a comparator group with any psychiatric disorder. Subgroup estimates are provided in accordance to study design. Effect sizes are reported as OR and 95% CIs. The sizes of the squares are proportional to sample sizes, and diamonds depict pooled effect size estimates through random-effects modeling.

Hospitalàries Research Foundation, c/ Dr. Pujades 38, 08830, Sant Boi de Llobregat, Barcelona, Catalonia, Spain).

The authors would like to apologize for any inconvenience caused.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.10.022.

References

Fazel, S., Sjöstedt, G., Långström, N., Grann, M., 2007. Severe mental illness and risk of sexual offending in men: a case-control study based on Swedish national registers. J. Clin. Psychiatry 68, 588–596.

Pulay, A.J., Dawson, D.A., Hasin, D.S., Goldstein, R.B., Ruan, W.J., Pickering, R.P., Huang, B., Chou, S.P., Grant, B.F., 2008. Violent behavior and DSM-IV psychiatric disorders: results from the national epidemiologic survey on alcohol and related conditions. J. Clin. Psychiatry 69, 12–22.

Webb, R.T., Lichtenstein, P., Larsson, H., Geddes, J.R., Fazel, S., 2014. Suicide, hospital-presenting suicide attempts, and criminality in bipolar disorder: examination of risk for multiple adverse outcomes. J. Clin. Psychiatry 75, e809–e816. https://doi.org/10.4088/JCP.13m08899.