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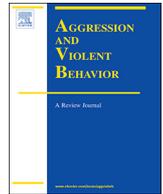
The association between psychopathy and delinquency in juveniles: A three-level meta-analysis

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A B S T R A C T

Background: Psychopathy has repeatedly been linked with delinquency and criminal recidivism of adults. With the increase of studies examining psychopathic traits in juveniles, it is important to also study this association in juveniles to increase the effectiveness of preventive interventions for juvenile delinquency.
Purpose: The primary aim of the present meta-analysis was to examine the association between psychopathic traits and delinquency in juveniles. The second aim was to examine which factors (i.e., type of delinquency, type of psychopathic trait, and other study- and participant characteristics) moderate the association between psychopathy and juvenile delinquent behavior.
Method: The data were analyzed in three-level meta-analytic models.
Results: In total, 87 studies were included, which used 74 independent samples and reported on 358 effect sizes. Psychopathy was moderately and positively associated with juvenile delinquency ($r = 0.24$, $p < .0001$). This overall association was not influenced by type of delinquency. However, stronger effect sizes were found for impulsivity traits than for callous unemotional traits.
Conclusion: Psychopathy in juveniles is associated with current and future offense behavior. Therefore, assessing psychopathy in juveniles is important for strengthening intervention efforts targeting juvenile delinquency.

Psychopathic traits are associated with current and future criminal behavior in adults (e.g., Frick & White, 2008; Hemphill, Hare, & Wong, 1998). This relation may already exist earlier in life, as empirical research showed that adolescents with personality problems are at risk for antisocial and delinquent behavior (e.g., Arthur, Hawkins, Pollard, Catalano, & Baglioni Jr, 2002; Heiden-Attema & Bol, 2000; Vaughn, Howard, & DeLisi, 2008). Given the importance of psychopathic traits in the prediction and etiology of delinquent behavior, it is essential to examine this relationship in juveniles in order to improve prevention and treatment of delinquency.

The first meta-analysis on the association between psychopathy and delinquency was conducted by Asscher et al. (2011), statistically summarizing the research until 2010. However, many new studies appeared after 2010, while in general research on psychopathic traits has increasingly become important in the explanation of the development and maintenance of serious juvenile delinquency over the last decade (Uytun, 2017). Also, a larger variety of instruments to assess psychopathic traits has been used in more recent research (e.g., DeLisi, 2016 for an overview). Moreover, recently a new three-level approach to meta-analysis has become available, which produces more reliable results by examining both within (level 2) and between (level 3) study differences in effect sizes, accounting for random sampling error (level 1), and which increases statistical power to detect moderator effects (Assink & Wibbelink, 2016).

Researchers tend to disagree on the number of factors to be distinguished in psychopathy. Researchers have distinguished a two (low emotionality and an unstable and/or antisocial lifestyle - Harpur, Hare, & Hakstian, 1989) and a four factor structure (interpersonal, affective, lifestyle, and antisocial traits - Hare, 2003). A three factor structure was proposed by Cooke and Michie (2001), which consists of callous-unemotional traits, impulsiveness, and narcissism, and has repeatedly been replicated (Asscher et al., 2011). Cooke, Michie, Hart, and Clark (2004) argued that the four factor structure does not define psychopathy adequately, because the antisocial traits factor would be rather a consequence than a primary symptom of psychopathy. This may result in content overlap between psychopathy and delinquent behavior, designated as criterion contamination, whereas it is especially important to disentangle these constructs in order to be able to adequately distinguish between psychopathic traits and delinquent behavior. The present meta-analysis examines the association between the Cooke- and

Michie three factor structure to avoid criterion contamination, which is consistent with the previous Asscher et al. (2011) meta-analysis that we aim to replicate.

Another issue to consider in defining psychopathy is the disagreement about the applicability of the psychopathy construct to both children and adolescents. Some researchers are against describing juveniles as showing psychopathic traits, because of its stigmatizing effect, while impulsiveness and sensation-seeking behavior reflect behavior that is part of typical developmental pathways, which shows a peak during adolescence, thus showing discontinuity over time (Edens, Skeem, Cruise, & Cauffman, 2001). Other researchers, however, provided evidence for the stability of psychopathy across the transition from adolescence to adulthood. For example, longitudinal research showed that psychopathy was moderately stable from ages 7 to 17 (Lynam et al., 2009), from ages 13 to 24, and ages 16 to 22 (Loney, Taylor, Butler, & Iacono, 2007; Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007). Moreover, evidence was found for the validity of psychopathy inventories for juveniles (Hawes, Mulvey, Schubert, & Pardini, 2014; Lynam, Derefinko, Caspi, Loeber, & Stouthamer-Loeber, 2007). Thus, although scholars disagree on the value of assessing psychopathic traits in juveniles, most research suggests that psychopathy is already visible in childhood and remains relatively stable throughout adolescence and adulthood.

To prevent negative outcomes and gain insight into the etiology of delinquent behavior as well as on how psychopathic traits and delinquent behavior are related, it is crucial to identify psychopathy at an early stage in life. Probably therefore, the interest in child psychopathy has increased enormously over the last decade (Uytun, 2017). As a consequence, many instruments for assessing psychopathy in children have been developed (DeLisi, 2016). It is thus important to investigate whether the strength of the association between psychopathic traits and delinquent behavior is affected by the assessment instrument that is used.

Additionally, as the focus of research on psychopathic traits and delinquency was originally on male and white adults (Skeem, Edens, Camp, & Colwell, 2004; Vaughn, Newhill, DeLisi, Beaver, & Howard, 2008), it is unclear if there are gender differences in the strength of the association between psychopathic traits and juvenile delinquency (Odgers, Moretti, & Reppucci, 2005). As psychopathic traits may be expressed differently by girls and boys it is important to consider potential gender differences. For example, studies have found that girls show less physical aggression and more relational aggression and manipulative behavior than boys (Colins, Fanti, Salekin, & Andershed, 2017). Also, girls with psychopathic traits often show increased levels of anxiety, which is not true for boys (Colins, Fanti, Andershed, et al., 2017; Colins, Fanti, Salekin, et al., 2017). These findings show that it is important to take gender differences into account.

Also, not much is known about ethnic differences in the association between psychopathic traits and delinquent behavior (Asscher et al., 2014). Most research that focused on the association between psychopathy and delinquency included participants from Northern-America and Western-Europa. It therefore remains unknown to what extent these results can be generalized to other parts of the world. In addition, it seems important to distinguish between different ethnic groups, because a study by Zwaanswijk, Van Geel, Andershed, Fanti, and Vedder (2018) found that non-Western juveniles with psychopathic traits showed more anxiety and impulsive behavior than Western juveniles with psychopathic traits, which might affect the association between psychopathic traits and delinquency.

Taken together, it remains unknown whether the association between psychopathy and delinquent behavior in juveniles is moderated by gender and ethnicity. In previous studies, sample sizes were often not sufficiently large to examine this association in subgroups. A meta-analysis provides a unique opportunity to examine differences in associations for small(er) subgroups by performing moderator analyses.

Summarizing, research should address the relationship between

psychopathic traits, delinquency, and recidivism, as this will gain insight into the risk factors for delinquent behavior in juveniles (Farrington, 2005). This knowledge will help professionals to be able to screen children who are at risk for negative developmental outcomes more adequately. The primary aim of the present study was to statistically summarize the research on the association between psychopathy and juvenile delinquency. Further, moderator analyses were conducted to investigate whether type of delinquency, type of psychopathic traits, and other study- and participant characteristics moderate this association. Although these aims were also central in the meta-analytic study of Asscher et al. (2011), replication was needed, because first, many new studies on the association between psychopathic traits and delinquent behavior have been published since 2010. Second, the present study improves the previous meta-analysis by using a three-level approach to meta-analysis. This way, all relevant information was preserved and maximum statistical power in the analyses could be achieved (see also Assink & Wibbelink, 2016).

1. Method

1.1. Sample of studies

All studies available from 2010 until January 2018 addressing the association between psychopathy and delinquent behavior were included in the present meta-analysis. First, the electronic databases Web of Science, PsycINFO, Eric, and Google Scholar were searched. The following combinations of keywords were used in this search: (psychopath* OR callous trait* OR unemotional trait) AND (delinquen* OR recidiv* OR conduct problem*) AND (youth OR adolesc* OR juvenile). Next, reference sections of important articles (e.g., Colins, Fanti, Andershed, et al., 2017; Colins, Fanti, Salekin, et al., 2017; Stockdale, Olver, and Wong, 2010) about the relationship between psychopathic traits and delinquent behavior were inspected. Finally, relevant authors were contacted to obtain unpublished manuscripts.

For the selection of studies, several inclusion and exclusion criteria were formulated, which were based on the inclusion criteria used in the meta-analysis of Asscher et al. (2011). First, the study had to be published between 2010 and 2018 and should have been written in English. Second, psychopathy or psychopathic traits had to be assessed before the age of 18, as young adulthood starts at the age of 18 and we were specifically interested in psychopathy in childhood. Third, a total psychopathy score had to be reported or psychopathic traits had to be defined according to the three-factor structure (i.e., the narcissistic, impulsive, and callous-unemotional factors) as described by Cooke and Michie (2001). All included studies had to examine zero-order correlations between psychopathic traits and delinquency. Delinquency was defined as criminal (i.e., law-breaking) acts committed by juveniles from community and/or convicted samples, and recidivism was defined as one or more reconvictions of juvenile offenders. Studies using self-report for assessing delinquency and recidivism, as well as studies based on official records were included. Studies examining other behavioral outcome measurements, such as aggression or conduct problems were not included. Even though aggression and delinquency are both characteristics of antisocial and rule-breaking behavior, they are defined and assessed differently (Dishion & Patterson, 2006). In addition, research showed that aggression and delinquency have different etiologies, as well as different developmental trajectories (Bongers, Koot, Van der Ende, & Verhulst, 2004; Dishion & Patterson, 2006).

Studies examining different sample types were included, such as (sex) offenders, clinical and at-risk samples, and community samples. When studies used the exact same sample and consequently reported the same association, only one of those studies was included. When it was not clear if studies reported on the same sample, the study authors were contacted to find out whether the studies were based on the same (sub)sample. If authors did not respond, both studies were included and given the same study identifier. Also, study authors were contacted
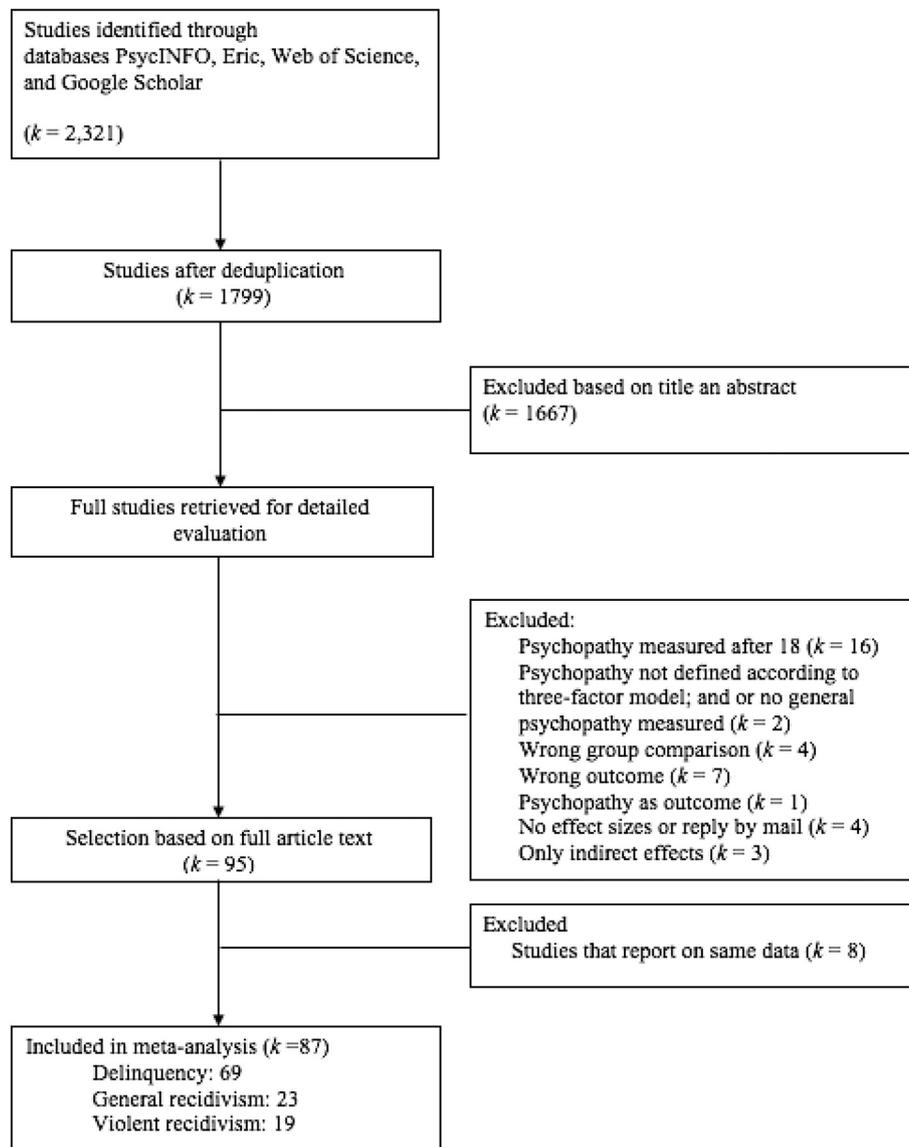
Studies identified through
databases PsycINFO, Eric, Web of Science,
and Google Scholar

(k = 2,321)

Studies after deduplication
(k = 1799)

Excluded based on title an abstract
(k = 1667)

Full studies retrieved for detailed
evaluation

Excluded:
Psychopathy measured after 18 (k = 16)
Psychopathy not defined according to
three-factor model; and or no general
psychopathy measured (k = 2)
Wrong group comparison (k = 4)
Wrong outcome (k = 7)
Psychopathy as outcome (k = 1)
No effect sizes or reply by mail (k = 4)
Only indirect effects (k = 3)

Selection based on full article text
(k = 95)

Excluded
Studies that report on same data (k = 8)

Included in meta-analysis (k =87)
Delinquency: 69
General recidivism: 23
Violent recidivism: 19

Fig. 1. Flowchart of the search results.

when too little information was provided for calculating one or more effect sizes. If authors did not respond (n = 3), their study was excluded.

The initial search resulted in 2321 studies. For the PRISMA statement flow diagram (Moher, Liberati, Tetzlaff, Altman, & Prima Group, 2009), see Fig. 1. In the end, 87 studies met the inclusion criteria. Some studies had overlapping samples and were therefore given the same study identifier. In total, 74 independent samples, with a total sample of N = 38,637 participants were included in the present review. An overview of the included studies and some of their characteristics is provided in Appendix A.

1.2. Coding the studies

The coding sheet was designed using the guidelines proposed by Lipsey and Wilson (2001) (see Appendix B). First, the type of psychopathic traits was coded for each association that could be extracted from the study. This was done using discrete variables with categories impulsivity, callous-unemotionality, and narcissism. The next variable of interest was the type of delinquency that was examined in studies, which was coded as a discrete variable (with categories delinquency, general recidivism, and violent recidivism). In addition, several study

and sample characteristics were coded, including gender, ethnicity, sample type, mean age, and age range. Also, study characteristics were coded for both analytic and descriptive purposes, which comprised study design, publication status, publication year of the study, impact factor of the journal, and country of data collection (i.e., USA, Europe, Canada, or other). As for assessment methods, type of informant for both delinquency and recidivism (i.e., self-report, other report, or official data), as well as the type of informant for psychopathy (i.e., self-report or other informants) was coded. Additionally, it was coded whether or not the same informants were used to gain information about psychopathic traits and delinquent behavior. Finally, the follow-up period in months, the type of instrument used for assessing psychopathy, the number of items this instrument was comprised of, and the reliability of these instruments in terms of Cronbach's alpha were coded.

To determine the interrater reliability, around 14% (n = 12) of the included studies were double coded by the first and second author. The percentage of overall agreement was 93.71%, which indicates a high overall interrater reliability.

1.3. Calculations and analyses

As we were interested in the association between psychopathy and juvenile delinquency, we chose for the correlation statistic as the central effect size in this meta-analysis. As correlations are not normally distributed, effect sizes were transformed into Fisher's z-scores by using the formula provided by Lipsey and Wilson (2001). Most studies reported point biserial correlations, which could easily be transformed into Fisher's z-scores. Nevertheless, a number of studies reported different types of effect sizes, such as AUCs, Cohen's ds, odds-ratios, and eta-squares. These effect sizes were first converted into correlations by using formula's provided by Cohen (1988), Rosenthal (1994), Borenstein, Hedges, Higgins, and Rothstein (2009), and Ruscio (2008). Standardized regression coefficients (i.e., beta's) were transformed into correlations by using the imputation approach explained by Peterson and Brown (2005). Next, these correlations were transformed into z-scores.

For most studies, it was possible to calculate bivariate statistics. However, a few studies only reported multivariate statistics, in which was controlled for other variables, such as age and ethnicity. Although these statistics did not represent zero-order correlations, we chose to include these statistics in the present meta-analysis, as was found that including multivariate statistics does not necessarily results in fundamentally different results (Peterson & Brown, 2005).

After all effect sizes were calculated in terms of Fisher's z, a three-level meta-analysis was performed to examine the overall association between psychopathy and juvenile delinquency. In the previous meta-analysis, Asscher et al. (2011) applied a traditional approach to meta-analysis, whereas in the present study, a three-level approach to meta-analysis was used. An important assumption of more traditional meta-analytic approaches is that all included effect sizes should be independent. A common solution to this is extracting only one effect size from each included primary study. However, by eliminating effect sizes, relevant information is lost (Assink & Wibbelink, 2016). On the contrary, a three-level approach to meta-analysis makes it possible to include all relevant information reported in primary studies by modeling the dependency of effect sizes derived from the same studies. As a consequence, (overall) associations can be better estimated and the statistical power in the (moderator) analyses is maximized. Based on these arguments, it is important to investigate whether the results of the previous meta-analysis are still valid when using the three-level approach to meta-analysis.

Three different sources of variances were taken into account: variance of the observed effect sizes at level 1, variance within studies at level 2, and variance between studies al level 3 (Assink & Wibbelink, 2016). To investigate whether excluding one of the variance parameters influenced the fit of the model, two one-sided log-likelihood-ratio-tests were performed. A significant result indicated a significant decrease in model fit when excluding level 2 or level 3 variance. In other words, significant results implied significant variance at the second or third level of the model, and that effect sizes were heterogeneously distributed (Assink & Wibbelink, 2016). If this was the case, moderator analyses could be conducted to investigate whether type of delinquency or type of psychopathic traits influenced the strength of the association, or whether the differences in effect sizes could be explained by study- and/or participant characteristics. For each moderator analysis, the

continuous variables were centered around the mean and the categorical variables were recoded into dummy variables.

The three-level analyses were performed in R (Version 3.2.0), using the "rma.mv" function of the metafor package (Viechtbauer, 2015). The syntax as described by Assink and Wibbelink (2016) was used to run the analyses. To calculate all model parameters, the restricted maximum likelihood estimate was used. Furthermore, the Knapp and Hartung adjustment (2003) was used to estimate the test statistics, standard errors, p-values, and confidence intervals of the individual regression coefficients. p-Values smaller than .05 were considered as statistically significant. After all analyses, Fisher z scores were retransformed into correlations for ease of interpretability.

1.4. Publication bias

We aimed to include all studies conducted between 2010 and 2018. Nevertheless, an important problem in meta-analysis is that studies reporting non-significant or unfavorable results are more difficult to find, which may lead to a so-called "publication bias" in the results (Rosenthal, 1979). As studies reporting significant results are more published and therefore easier to find, these studies are more often included in meta-analyses then studies reporting non-significant effects. This may result in an overestimation of the true effect size. In order to investigate whether this was a problem in our review, we performed the trim-and-fill procedure as described by Duval and Tweedie (2000). For this purpose, we used the function "trimfill" of the metafor package (Viechtbauer, 2010) in R (Version 3.2.0). First, the number of missing data points was estimated by drawing a funnel plot. Subsequently, it was formally tested whether effect sizes were missing on the left side of the distributions (since publication bias is only likely to occur when negative or small (non-significant) effects are missing in the data).

2. Results

2.1. Overall association, heterogeneity in effect sizes, and bias assessment

Our meta-analysis on the association between psychopathy and juvenile delinquency was based on $k = 74$ independent studies, reporting on 358 effect sizes, and a total sample of $N = 38,637$ participants. The analysis yielded a moderately significant effect size of $r = 0.24$ (95% CI = 0.20–0.30; $p < .001$), which indicates that the presence of higher levels of psychopathy were associated with more delinquent behavior (see Table 1). Further, the results of the log-likelihood-ratio-tests revealed significant variance within studies (i.e., variance at level 2), $\chi^2(1) = 135.47$, $p < .001$ and significant variance between studies (i.e., variance at level 3), $\chi^2(1) = 3472.13$, $p < .001$. Since the effect sizes proved to be heterogeneous, we proceeded with conducting moderator analyses to test whether the different study and sample characteristics that were coded can explain differences in effect sizes. The results of the categorical and continuous moderator analyses are presented in Tables 2 and 3, respectively. The results of the trim-and-fill analysis showed that bias may have been present in our dataset, as small and insignificant effect sizes seemed underrepresented in the dataset (see Fig. 2 for the funnel plot). Thus, when interpreting the results, it is important to take into account that the overall effect size found in the present meta-analysis may be an overestimation of the true

Table 1
Overall effect between psychopathy and delinquency.

	s	k	N	Fisher's z	ESr	σ^2_{level2}	σ^2_{level3}	% var. level 1	% var. level 2	% var. level 3
Overall association	74	358	38,637	0.248***	0.243	0.001***	0.038***	5.83	3.12	91.05

Note. s = number of independent studies; k = number of effect sizes; N = total sample size of this meta-analysis; ESr = effect size in r; σ^2_{level2} = variance between effect sizes extracted from the same studies; σ^2_{level3} = variance between studies.

  *** $p < .001$.

Table 2
Results of discrete moderator analyses.

	s	k	β₀ (95% CI)	ESr	β₁ (95% CI)	F(df1, df2)
Type of delinquency	74	358				0.920 (2, 355)
Delinquency (RC)	60	197	0.251 (0.199; 0.303)***	0.246		
General recidivism	19	91	0.229 (0.169; 0.289)***	0.290	−0.022 (−0.068; 0.023)	
Violent recidivism	15	70	0.244 (0.182; 0.306)***	0.239	−0.007 (−0.059; 0.045)	
Construct characteristics						
Psychopathic trait	74	357				67.434 (2, 354)***
Callous-unemotionality (RC)	58	119	0.230 (0.179; 0.281)***	0.226		
Impulsivity	34	75	0.310 (0.261; 0.360)***	0.300	0.088 (0.072; 0.104)***	
Narcissism	36	73	0.271 (0.219; 0.322)***	0.265	0.006 (−0.010; 0.022)	
Study characteristics						
Study design	74	358				51.094 (1, 356)***
Cross-sectional (RC)	56	167	0.300 (0.249; 0.350)***	0.291		
Longitudinal	28	191	0.211 (0.161; 0.260)***	0.208	−0.089 (−0.113; −0.064)***	
Informant psychopathy	74	353				0.011 (1, 351)
Self-report (RC)	64	283	0.250 (0.199; 0.300)***	0.245		
Other	18	70	0.247 (0.190; 0.304)***	0.242	0.003 (−0.031; 0.025)	
Informant offending	70	335				4.420 (2, 332)**
Self-report (RC)	48	154	0.249 (0.201; 0.297)***	0.244		
Official data	28	171	0.242 (0.190; 0.294)***	0.237	−0.007 (−0.051; 0.037)	
Other report	5	10	0.339 (0.261; 0.417)***	0.327	0.090 (0.02; 0.16)*	
Informant on pp. and offending	58	298				0.517 (1, 296)
Same informant (RC)	23	128	0.238 (0.186; 0.291)***	0.234		
Different informant	35	170	0.219 (0.17; 0.27)***	0.216	−0.019 (−0.073; 0.034)	
Psychopathy instrument	74	357				10.064 (4, 352)***
PCL (RC)	16	129	0.347 (0.285; 0.410)***	0.334		
ICU	18	23	0.200 (0.132; 0.269)***	0.197	−0.147 (−0.213; −0.081)***	
YPI	22	104	0.255 (0.198; 0.312)***	0.250	−0.092 (−0.127; −0.057)***	
APSD	19	67	0.274 (0.213; 0.334)***	0.267	−0.074 (−0.124; −0.024)**	
Other	16	34	0.190 (0.125; 0.254)***	0.188	−0.158 (−0.218; −0.098)***	
Country	73	350				3.141 (3, 346)**
USA (RC)	31	111	0.179 (0.114; 0.244)***	0.177		
Canada	14	93	0.181 (0.053; 0.310)**	0.179	0.059 (0.008; 0.110)*	
Europe	26	143	0.264 (0.193; 0.334)***	0.258	0.125 (0.030; 0.220)**	
Other	6	26	0.224 (0.118; 0.331)***		0.174 (0.009; 0.338)*	
Publication status	74	358				0.722 (1, 356)
Published (RC)	64	302	0.251 (0.201; 0.302)***	0.246		
Unpublished	11	56	0.221 (0.139; 0.302)***	0.217	−0.031 (−0.101; 0.040)	
Participant characteristics						
Sample type	74	358				6.409 (2355)**
Offender (RC)	38	217	0.260 (0.197; 0.323)***	0.254		
Community	23	91	0.283 (0.196; 0.371)***	0.276	0.023 (−0.081; 0.128)	
Combined	13	50	0.153 (0.077; 0.229)***	0.152	−0.107 (−0.168; −0.046)***	
Gender	74	358				2.517 (2, 355)
Boys (RC)	30	116	0.284 (0.220; 0.348)***	0.277		
Girls	10	40	0.246 (0.167; 0.324)***	0.241	−0.052 (−0.110; 0.006)	
Combined	41	206	0.241 (0.180; 301)***	0.236	−0.054 (−0.121; 0.014)	

Note: s = number of independent studies; k = number of effect sizes; β₀ = intercept/mean effect size in Fisher's z; ESr = effect size expressed in r; β₁ = estimated regression coefficient; CI = confidence interval; F(df1, df2) = omnibus test; RC = reference category.

  * $p < .05$.
  ** $p < .01$.
  *** $p < .001$.

Table 3
Results of continuous moderator analyses.

Tested variable	S	k	β₁ (95% CI)	F(df1, df2)
Study characteristics				
Impact factor	48	220	−0.007 (−0.036; 0.021)	0.601 (1, 218)
Publication year	74	358	−0.30 (−0.039; −0.021)***	47.099 (1, 356)***
Length psychopathy instrument	65	210	−0.002 (−0.003; −0.002)***	30.518 (1, 208)***
Reliability psychopathy assessment	65	292	0.010 (0.006; 0.014)***	22.949 (1, 290)***
Follow-up length (in months)	28	174	−0.001 (−0.001; −0.000)**	7.450 (1, 172)**
Participant characteristics				
Age (in years)	64	318	0.023 (−0.003; 0.050)	2.991 (1, 316)
% immigrants in samples	55	266	−0.000 (−0.001; 0.001)	0.047 (1, 264)

Note. s = number of independent studies; k = number of effect sizes; β₁ = estimated regression coefficient; CI = confidence interval; F(df1, df2) = Omnibus test (F test).
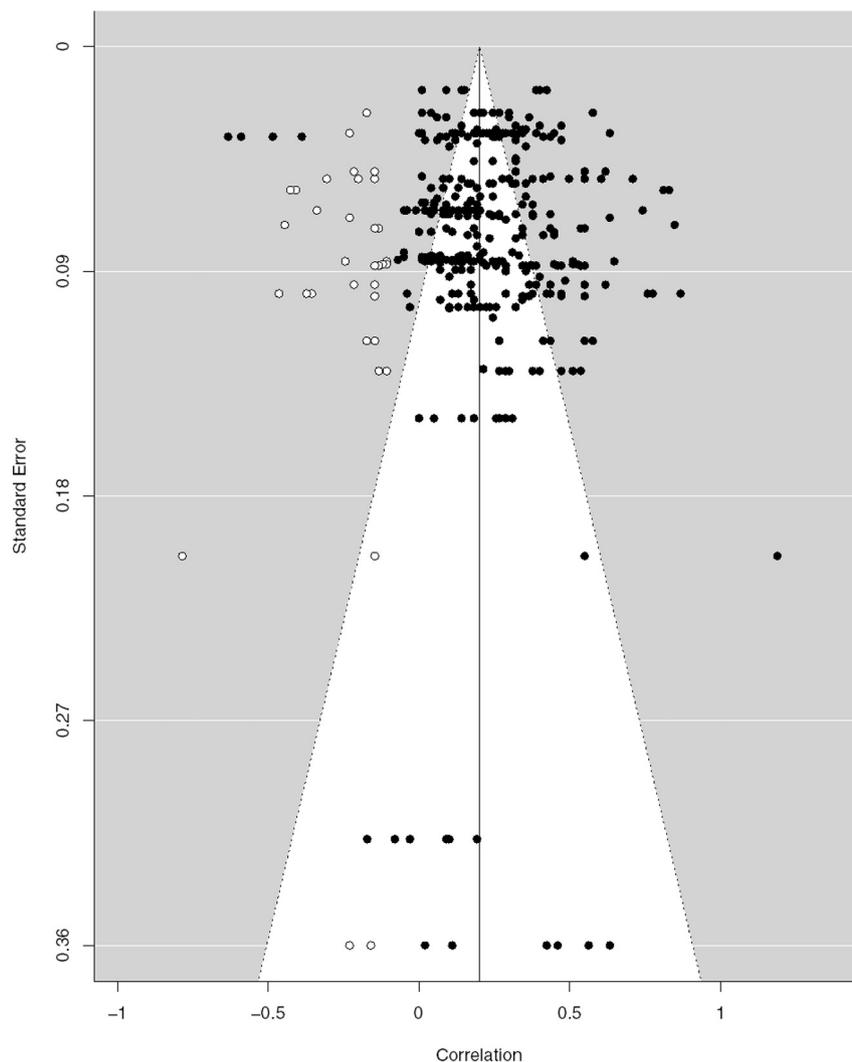
  ** $p < .010$.
  *** $p < .001$.

Fig. 2. Funnel plot.

Note. The black dots illustrate the observed effect sizes, and the white dots illustrate the filled effect sizes. The solid vertical line represents the overall association between psychopathy and delinquency in juveniles, and the dashed line illustrates the 90% confidence interval.

effect size.

2.2. Moderating variables

2.2.1. Construct characteristics

The results of the discrete moderator analyses are shown in Table 2. As for delinquency type, the results showed that the overall association between psychopathy and delinquency was not influenced by type of delinquency, $F(2, 355) = 0.92$, $p = .40$. This implies that the strength of this association is the same across the three types of delinquency that were examined in this review. As for type of psychopathic traits, the moderator analysis showed that the association between psychopathy and delinquency is significantly stronger for impulsivity traits ($r = 0.31$), than for callous unemotional traits ($r = 0.23$), $F(2, 354) = 67.43$, $p < .001$. Narcistic traits were not differently associated with delinquency than callous-unemotional traits.

2.2.2. Study- and participant characteristics

Analyses of the categorical moderators showed that the association between psychopathy and juvenile delinquency was stronger in studies using a cross-sectional design ($r = 0.30$) than in studies using a longitudinal design ($r = 0.21$), $F(1, 356) = 51.09$, $p < .001$. Further, significant weaker effect sizes were found when information on

delinquency was gathered using self-reports ($r = 0.25$), compared to official records ($r = 0.24$), and other type of informants ($r = 0.34$), $F(2, 332) = 4.42$, $p = .013$ Further, the strength of the effect was strongest when the PCL was used as psychopathy assessment instrument ($r = 0.33$), $F(1, 352) = 10.06$, $p < .001$. Also, strongest effect sizes were found for studies conducted in Europe ($r = 0.26$), $F(1, 346) = 4.45$, $p = .004$. As for sample characteristics, the strength of the association between psychopathy and juvenile delinquency was significantly stronger for offender samples ($r = 0.26$) than for community (r - 0.28), and mixed samples ($r = 0.15$), $F(2, 355) = 6.409$, $p = .002$. No moderating effects were found for type of informant on psychopathy, whether or not the psychopathic traits and delinquent behavior were reported by the same (type of) informant, publication status, and gender of the sample.

Analyses of the continuous moderators revealed significant moderator effects for several study- and participant characteristics (see Table 3). First, the results showed that the strength of the association between psychopathy and juvenile delinquency decreased, as the instrument length of psychopathy assessment tools increased, $F(1, 208) = 30.52$, $p < .001$. Second, stronger associations were reported in studies using more reliable measurements for psychopathic traits, $F(1, 290) = 22.95$, $p < .001$. Third, we found that associations between psychopathy and delinquency decreased, as the follow-up period (in

months) increased, $F(1, 172) = 7.45$, $p = .007$. Fourth, we found that the strength of the overall association decreased, as the publication year of studies increased, $F(1, 356) = 47.10$, $p < .001$. No significant moderator effects were found for journal impact factor, mean age of the sample, and percentage of immigrants in samples.

3. Discussion

The present review aimed to investigate the association between psychopathy and delinquency in youth. A further aim was to investigate which factors moderate the overall strength of this association. This study is an extension of a previous review of Asscher et al. (2011). To our believes, an update of this review was necessary, as research on psychopathy and delinquency has grown promptly since 2010, which was the cut-off year for study inclusion used by Asscher et al. Also, Asscher et al. (2011) did not apply a three-level approach to their meta-analysis and chose to perform a more traditional meta-analysis in which they extracted only one effect size from each included study.

The current meta-analysis showed that, in juveniles, moderate associations were found for the association between psychopathy and delinquency. These results replicate the findings of Asscher et al. (2011). The different research methodology and the large increase in number of studies did not change the 2011 findings. The results of the present meta-analysis underline the importance of psychopathy in delinquent behavior, indicating that this is a factor of importance to consider in treatment, also when focusing on juveniles.

When investigating whether the strength of the association between psychopathy and delinquency was influenced by type of psychopathic traits, we found that impulsiveness was most strongly associated with delinquency and that this effect significantly differs from the effect of callous-unemotional traits. Interestingly, the previous study by Asscher et al. (2011) also found weaker associations for callous-unemotional traits, even though other researchers argue that callous-unemotional traits are the most important predictors of delinquency (Frick, 2012). As in the previous meta-analysis, almost all participants of included studies were adolescents between age 12 and 18. This is a period in which children often show high levels of impulsive behavior (Edens et al., 2001), which could explain the larger effect sizes for impulsivity. Nonetheless, studies that included older participants also found that impulsive traits are most strongly related to delinquent behavior. For instance, in a sample with a mean age of 22.15 years correlations of 0.31, 0.25, and 0.19 were found for impulsivity, narcissism, and callous-unemotionality respectively (Colins & Andershed, 2016). Another study that included participants with a mean age of 35.2 years showed that the impulsivity factor consistently and significantly predicted recidivism, whereas the other two factors did not have a significant predictability (Olver, Neumann, Wong, & Hare, 2013). Thus, more recent studies have shown that impulsive traits are more strongly related to delinquent behavior than callous-unemotional traits, for adolescents as well as for adults. This result is remarkable as individual studies suggest that callous-unemotional traits and narcissism are important predictors of persistent violent offending in particular (Corrado, McCuish, Hart, & DeLisi, 2015; McCuish, Corrado, Hart, & DeLisi, 2015). Future research should further differentiate between psychopathic traits and different types of delinquent behavior more specifically.

3.1. Study characteristics as moderators

Several study characteristics moderated the association between psychopathy and delinquency. First, the present study as well as the previous study by Asscher et al. (2011) showed that studies using self-reported or official data to assess delinquent behavior, found smaller effect sizes than studies using other types of informants. This may be due to the fact that adolescents tend to underreport on their delinquent behavior (White, Cruise, & Frick, 2009). In addition, studies using

official data may underestimate the relationship between psychopathy and (re)offending, since not all criminality is registered in the justice systems (Soares, 2004). For instance, not all juvenile offenders get arrested and are convicted, which may be the results of selection bias in the justice systems (Myers, 2003). Moreover, official data rely on the willingness of witnesses and victims to report criminal acts, as well as on the willingness of the police officers to process cases (Blom, Van der Laan, & Huijbregts, 2005). For these reasons, severe crimes may remain invisible. Nonetheless, it is plausible to assume that people with personality disorders may be the ones to commit more serious offenses. However, if these crimes are not registered, the association between psychopathic traits and delinquency could be underestimated. All in all, caution is needed when interpreting the results of studies using only self-reported or official data to measure delinquency, as conclusions based on self-reported data as well as conclusions based on official data may be flawed. To improve the validity of the results, studies addressing the relationship between psychopathy and delinquency should use multiple information sources (e.g., parental/teacher reports, self-reports, clinical judgements, and official data) to assess both constructs.

Further, both meta-analyses found that the association between psychopathy and delinquent behavior was the strongest when the PCL was used. The PCL is an interview-based assessment tool, whereas the other measurements are almost all self-reports, which could explain the higher effect sizes. Expert rating scales are preferred over self-report measurements, as these instruments measure psychopathy more accurately (Corrado, DeLisi, Hart, & McCuish, 2015). Alternatively, the PCL might be better in measuring characteristics that are associated with delinquent behavior (Asscher et al., 2011), which validates the use of PCL when screening children at risk for delinquency. On the other hand, stronger associations between the PCL and delinquent behavior may also be ascribed to contamination between the constructs psychopathy, as measured by the PCL, and delinquency (Asscher et al., 2011). This would discourage the use of the PCL, as some items assess not only psychopathic traits, but also criminal behavioral characteristics.

Also in line with the previous meta-analysis, this study found larger effect sizes for published studies, indicating that more often smaller than larger effect sizes are buried in "file drawers" (Rosenthal, 1979). Even though this moderating effect was non-significant, the results of the file-drawer analysis confirmed that small and insignificant effect sizes were underrepresented in the dataset. These results suggest that studies reporting significant results are more likely to get published (Iyengar & Greenhouse, 1988). Larger effect sizes were found in cross-sectional studies than in longitudinal studies, but this moderating effect was not found by Asscher et al. (2011). In cross-sectional studies, constructs are most often measured by a single questionnaire at a single moment, which could result in inflated correlations, whereas longitudinal studies measure constructs at different time points (Rindfleisch, Malter, Ganesan, & Moorman, 2008). Thus generally, cross-sectional studies find stronger associations than longitudinal studies. We also found that the strength of the association between psychopathy and delinquency decreased as follow-up length increased, which is in line with this finding.

In addition, the country where the data were collected influenced the strength of the association in both meta-analyses. However, the previous meta-analysis by Asscher et al. (2011) showed that the relationship between psychopathy and delinquency was strongest in studies that were conducted in Canada. On the contrary, the current analysis showed that this association was strongest in European studies. Nevertheless, it is important to take into account that the previous meta-analysis on delinquency included very little studies conducted in Canada. Moreover, the differences between countries might be caused by differences in quality of youth services and policies initiatives between Europe and the USA. For instance, if countries investigate more time and money in preventing and detecting criminal behavior among juveniles, it is very likely that assessment methods are better developed.

As a consequence, studies conducted in these countries are better at identifying psychopathic traits and delinquent behavior among juveniles, which could result in higher correlations. On the other hand, these studies might also be better in differentiating between psychopathy and delinquency. This would lead to less overlap and thus to lower correlations between psychopathy and delinquency.

3.2. Sample characteristics as moderators

With regard to sample characteristics, sample type affected the strength of the association between psychopathy and delinquency. Larger effect sizes were found in studies using offender samples or community samples relative to studies using mixed samples, whereas in the previous meta-analysis, effect sizes were largest in samples that consisted of both offenders and non-offenders. However, the results of the previous meta-analysis were based on only very few studies, and consequently, one study with a large effect size in a mixed sample may have affected the previous results. For instance, the previous meta-analysis by Asscher et al. (2011) included the study of Penney and Moretti (2007), who have reported a regression coefficient of 0.60, which could have highly influenced the results. Another possible explanation is that the combined samples in the present study consisted mainly of offenders and non-offenders who are at risk for delinquent behavior due to mental health concerns. Notwithstanding, the combined samples in the previous study consisted of more adolescents from the general population. Consequently, the variation in combined samples of studies included in the present review is lower than the variation in combined samples of studies that were included in Asscher et al. (2011), which may have resulted in smaller effect sizes in the current meta-analysis.

Further, Asscher et al. (2011) found higher correlations between psychopathy and delinquency in mixed gender-samples, whereas the results of the present study showed that the strength of the association was not moderated by sex. These results indicate that besides boys, girls showing psychopathic traits are an important risk group for delinquent behavior. Moreover, the present study showed that that the strength of the association between psychopathy, delinquency, and recidivism was not moderated by the percentage of immigrants in study samples. This result indicates that psychopathy is also an important risk factor for delinquency in minority groups. Therefore, it is valuable to also assess psychopathy in ethnic minority groups. Further, no moderating effect was found for mean age of study samples, indicating that the strength of the association between psychopathy and delinquency is not affected by the age of offenders.

In line with the previous meta-analysis, higher correlations were found in studies that assessed psychopathy with instruments of shorter length. This might be due to the fact that shorter instruments only assess risk factors that actually have a predictive value, whereas longer instruments also assess items that are not directly related to psychopathic traits. Thus, more lengthy instruments are not necessarily better in detecting psychopathy among juveniles. Furthermore, the present as well as the previous review of Asscher et al. (2011) found smaller associations in studies that were more recently published. A possible explanation is that more recent studies used assessment tools of better quality (i.e., assessment tools that have a higher reliability and validity), and therefore, features of psychopathy and/or criminal behavioral characteristics can be better separated from each other in more recent studies.

3.3. Limitations

There are some limitations of this meta-analysis that should be mentioned. First, the results must be interpreted with caution, since we found reasons to suspect publication bias in the present study. Nevertheless, the performance of the trim-and-fill method is limited when effect sizes are interdependent and heterogeneous (Nakagawa &

Santos, 2012; Peters, Sutton, Jones, Abrams, & Rushton, 2007).

The second limitation concerns the operationalization of psychopathy. In the present meta-analysis we chose to examine the three factor structure of impulsivity, narcissism, and callous-unemotional traits in order to avoid inflation of the association between psychopathy and delinquency through contamination of measures. However, it is important to keep in mind that antisocial traits may be an aspect of psychopathy too. DeLisi (2016, 2009) argued that contamination can be avoided if researchers remove identical items from measures of antisocial traits and delinquency. Future research should establish whether contamination of existing measures of antisocial traits and delinquency has an effect on the association between psychopathy and delinquency.

Third, the present meta-analysis does not allow for inferences about causality. Even though the results show that psychopathy is related to delinquent behavior, we cannot say that psychopathy causes delinquency. Psychopathy is often not the only risk factor present, but coexists and interacts with other factors (Corrado, DeLisi, et al., 2015; Corrado, McCuish, et al., 2015; Loeber, Burke, & Pardini, 2009). Thus, when screening children at risk for delinquent behavior, it is important to assess multiple factors. Nevertheless, the present study showed that psychopathy and psychopathic traits should always be considered in relation to the existence of delinquent behavior, and may also be an important factor in treatment.

Fourth, a limited number of studies included in the meta-analysis investigated the association between psychopathy and prospective delinquent behavior. Consequently, the overall effect is mostly determined by the association between psychopathy and offense behavior measured at a single point in time. Future research should more often include recidivism as an outcome in research on delinquent behavior.

4. Conclusion and implications

Despite these limitations, this study is the first meta-analysis on the association between psychopathy and delinquency using a three-level approach, which is a strong method for dealing with interdependency of effect sizes (Assink & Wibbelink, 2016). Moreover, this study focused more on females and immigrants, instead of male, white samples. Interestingly, the present study showed that psychopathy is also an important risk factor for delinquent behavior for girls and immigrants. Lastly, the present study focused on the affective features (i.e., callous-unemotional traits) of psychopathy in particular. The callous-unemotional factor is seen as a very important factor of psychopathy, as it distinguishes psychopathy from antisocial behavior in general (Asscher et al., 2011). This is also acknowledged by other researchers, and over the last years, a lot of attention has been drawn to the relation between callous-unemotional traits and delinquency, as the majority of the articles included in the current meta-analysis focus on these traits in particular. Therefore, the present meta-analysis had larger power to detect an effect. Pointedly, the current analysis revealed relatively large effects for affective features (i.e., $r = 0.23$ in the present meta-analysis compared to $r = 0.17$ in the previous study), indicating that callous-unemotional traits play an important role in explaining delinquency. Nevertheless, the effect sizes for the other two psychopathic traits remained larger, showing that the behavioral dimension is more strongly related to offense behavior. Whether this stronger association really exists or whether this is due to content-overlap between the behavioral features of psychopathy and delinquent behavior, remains unknown. Thus, future research is needed to further investigate the role of psychopathic traits on delinquency and recidivism. For instance, studies should further examine construct and criterion validity of both psychopathy and delinquency.

The finding that the behavioral dimension is most strongly related to offense behavior could have important implications for clinical practice, as this dimension relates psychopathy to other behavioral problems, such as conduct disorders. Therefore, clinicians could consider including psychopathic traits as a specifier for subtyping children

with conduct disorders in order to designate a subgroup of children with severe and complex behavioral problems. Callous-unemotional traits have already been included in the DSM-5 as a specifier of conduct disorders (APA, 2013), but the narcissistic and impulsive dimensions could also be considered as a subtype marker of conduct disorder (Salekin, 2016). Before adjusting the DSM criteria, future research should investigate the interaction between these two factors and conduct disorder.

Besides the fact that much is still unknown about the role of psychopathic traits in explaining juvenile delinquency, the present study showed moderate associations between psychopathy and delinquency. Consequently, early detection of psychopathic traits in children is important, since higher levels of psychopathy are associated with higher levels of current and future offense behavior. Thus, psychopathy is an important risk factor for delinquent behavior in juveniles that deserves attention in risk and needs assessment. It would be valuable to already assess psychopathic traits in the first phase of the diagnostic process, by including psychopathy in the risk assessment instruments. In addition, therapists should take psychopathy into account during the treatment phase as well. Even though it was thought that psychopaths are resistant to treatment, research has shown that delinquent juveniles with psychopathic traits are also likely to benefit from treatment and are best served by long-term and intensive treatment (Caldwell, Skeem, Salekin, & Van Rybroek, 2006). For instance, the Mental Models Approach for Psychopathy (Salekin, 2008) showed promising results in decreasing problem behavior among psychopathic juveniles. Further, schema focused therapy could be a promising technique for treating forensic patients with psychopathic traits, as schema therapy focusses on enhancing the therapeutic relationship, which may help patients to overcome their emotional detachment (Bernstein et al., 2012; Bernstein, Arntz, & Vos, 2007). Even though the study conducted by Bernstein et al. (2012) focused on adults, other research has shown that schema therapy can also be a valuable framework for understanding developmental problems in juveniles (Van Vlierberghe, Braet, Bosmans, Rosseel, & Bögels, 2010). Overall, it is important to overcome resistance and enhance involvement (Caldwell et al., 2006). This could improve the treatment response and consequently also treatment outcomes. All in all, it can be concluded that juveniles with psychopathic traits should be provided adequate treatment in order to reduce the risk for delinquent behavior and recidivism.

Declaration of competing interest

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Appendix A. Supplementary data

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