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Review article

Psychopathic traits and theory of mind task performance: A systematic review and meta-analysis

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ABSTRACT

This meta-analysis aims to examine the relationship between psychopathic traits and theory of mind (ToM), which is classically and broadly defined as competency in representing and attributing mental states such as emotions, intentions, and beliefs to others. Our search strategy gathered 142 effect sizes from 42 studies, with a total sample size of 7463 participants. Random effects models were used to analyze the data. Our findings suggested that psychopathic traits are associated with impaired ToM task performance. This relationship was not moderated by factors such as age, population, psychopathy measurement (self-report versus clinical checklist) or conceptualization, or ToM task type (cognitive versus affective). The effect also remained significant after excluding tasks that did not require the participant to 1) mentalize or 2) differentiate between self and other perspectives. However, interpersonal/affective traits were associated with a more pronounced impairment in ToM task performance compared to lifestyle/antisocial traits. Future research should investigate the effects of distinct psychopathy facets that will allow for a more precise understanding of the social-cognitive bases of relevant clinical presentations in psychopathy.

1. Introduction

The term psychopathy refers to a constellation of personality traits including impulsivity, low empathy, manipulation, and exploitation of others (Cleckley, 1941; Hare, 2003). These disturbances tend to be concealed behind a proverbial "mask of sanity" (Cleckley, 1941), characterized by an outward appearance of positive adjustment. Estimates of the prevalence of psychopathy in the general adult population range from approximately 1% (Hare, 2003) to 4.5% (Sanz-García et al., 2021), with estimates as high as 10–35% in the offender or prison population (Fox and DeLisi, 2019; Guay et al., 2018; Nicholls et al., 2005). Although psychopathy is primarily diagnosed in criminal justice settings, taxonomic research suggests that psychopathic traits are distributed along a continuum in the general population (Edens et al., 2006; Guay et al., 2007). Psychopathy is associated with a heightened risk for aggression and violence across populations, measurement types, and outcome measures (Gillespie et al., 2022), making it a construct of broad interest in academic, criminal justice, and public policy settings. The annual costs associated with psychopathy were estimated to be around US $460 billion in 2009, making it arguably the most financially costly mental health disorder (Kiehl and Hoffman, 2011).

In criminal justice settings, psychopathy is typically assessed using the Psychopathy Checklist-Revised (PCL-R), a clinical rating scale and the only instrument used to diagnose psychopathic personality. The PCL-R is composed of two factors/four facets (Hare, 2003; Hare and Neumann, 2008). Factor 1 of the PCL-R includes an interpersonal facet (e.g., manipulative behavior, pathological lying) and an affective facet (e.g., callous/lack of empathy, shallow affect), while Factor 2 includes a lifestyle facet (e.g., irresponsibility, impulsivity) and an antisocial facet (e.g., criminality, poor behavioral controls). This two-factor/four-facet structure has been mirrored in self-report psychopathy questionnaires, including the Self-report Psychopathy Scale (Paulhus et al., 2016), which also includes interpersonal, affective, lifestyle, and antisocial facets. The Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995) also employs a two-factor conceptualization of psychopathy, which was intended to parallel the two-factor structure of the PCL-R

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(the LSRP subscales are termed primary and secondary psychopathy, respectively). However, some studies have critiqued the factor structure of the LSRP, suggesting that a three factor structure (i.e., Egocentricity, Callousness, and Antisocial) may be more reliable (Brinkley et al., 2001; Salekin et al., 2014).

The PCL-R conceptualization of psychopathy has been criticized on some grounds. For example, Skeem and Cooke (2010) argued that antisocial traits indexed by the antisocial facet/Factor 2 of the PCL-R may better represent a downstream correlate of psychopathy. These authors have instead proposed a three-factor model (i.e., interpersonal, affective, and lifestyle features), which excludes direct operationalizations of antisocial behavior (Cooke and Michie, 2001), arguing that behavioral conduct (e.g., an act which results in a criminal conviction) should not be confused with personality traits (e.g., a callous inclination to commit crime). This three-factor structure is also mirrored in a self-report questionnaire, namely the Youth Psychopathic Traits Inventory (YPI) (Andershed et al., 2002), which includes subscales indexing grandiose-manipulative, affective, and impulsive-irresponsible features.

A three-factor structure is also favored by Patrick et al. (2009), who proposed an alternative conceptualization of psychopathy, as assessed using the Triarchic Psychopathy Measure (TriPM). The triarchic measure assesses psychopathy along three dimensions: (1) boldness (e.g., social dominance, emotional resilience); (2) meanness (e.g., aggressive competitiveness without regard for others); (3) disinhibition (e.g., lack of impulse control and poor emotion regulation). Notably, various other inventories also include a three factor structure that shares considerable conceptual overlap with the TriPM, such as the Psychopathic Personality Inventory (Lilienfeld and Andrews, 1996), which includes subscales indexing fearless dominance, cold-heartedness, and self-centered impulsivity.

Although these different instruments assess closely-related overarching constructs of psychopathy (Evans and Tully, 2016), the precise features being assessed can vary. For example, the inclusion of psychopathic boldness, which is assessed by the TriPM but is not explicitly assessed by the PCL-R, has been controversial (Sleep et al., 2019), and some have argued that boldness is of questionable relevance to psychopathy (for a review, see Lilienfeld et al., 2018). Nonetheless, the boldness dimension shares some conceptual overlap with Factor 1/interpersonal features of psychopathy, while meanness and disinhibition dimensions share overlap with Factor 1/affective and Factor2/-lifestyle/antisocial features of psychopathy, respectively (Drislane et al., 2014; Patrick and Drislane, 2015; Pauli et al., 2021; Sellbom et al., 2018; Venables et al., 2014).

One of the cardinal features of psychopathic personality that each of these measurement models have in common is a distinct lack of empathy and callous disregard for others. However, the term empathy is complex and multi-faceted. A recent review suggested that empathy involves four themes: understanding (i.e., to understand another person's world), feeling (i.e., to feel what another person is feeling), sharing (i.e., to share another person's world), and self-other differentiation (i.e., to differentiate between their own feelings and those of another person) (Eklund and Meranius, 2021). The difference between understanding another's world, and feeling or sharing with another, is also captured in a commonly made distinction between 'cognitive' and 'affective' empathy (Decety and Jackson, 2006; Reniers et al., 2011). Cognitive empathy is defined as the competency in recognizing and understanding others' mental states, whereas affective empathy refers to the ability to feel what another is feeling. The cognitive aspect of empathy overlaps with theory of mind (ToM), and is classically and broadly defined as the ability to represent and attribute mental states such as thoughts, intentions, and beliefs to others (Gallese and Sinigaglia, 2011; Premack and Woodruff, 1978).

The literature on empathy is further complicated by a distinction in the ToM literature between cognitive and affective ToM processes. While cognitive ToM refers to understanding the thoughts, intentions, and beliefs of another, affective ToM refers to making affective or emotional representations of others' mental states (Dvash and Shamay-Tsoory, 2014; Healey and Grossman, 2018; Shamay-Tsoory et al., 2010). Importantly, despite similar terminology, affective ToM should not be confused with affective empathy, with the latter instead referring to the ability to feel what another is feeling.

In support of a distinction between cognitive and affective ToM, Healey and Grossman (2018) suggested that these constructs are underpinned by both shared and non-shared cognitive and anatomic substrates. For instance, while both cognitive and affective ToM engage regions such as the temporoparietal junction, precuneus, and temporal poles, only affective ToM engages regions within the limbic system and basal ganglia. A distinction between cognitive and affective ToM is also supported by a series of transcranial magnetic stimulation (TMS), neuroimaging, and lesion studies (Kalbe et al., 2010; Sebastian et al., 2011; Shamay-Tsoory and Aharon-Peretz, 2007).

One final complexity is the extent to which emotion recognition is similar to or distinct from affective ToM. Although it is argued by some that (affective) ToM is closely linked to emotion perception and recognition, others have drawn a somewhat fine distinction. For example, Mier et al. (2010) explored the relationship between emotion recognition and affective ToM using an event-related fMRI study. The results suggest a close relationship between emotion recognition and affective ToM, with overlapping activation during both facial emotion recognition and emotional intention recognition (affective ToM) tasks. The authors suggested that the results can be interpreted as evidential support that at least basal forms of ToM arise through an embodied, non-cognitive process, and that compared to emotion recognition, affective ToM requires additional perceptional processes. Similarly, Mitchell and Phillips (2015) reviewed various conceptual models and neuroanatomical overlaps between emotion perception and ToM, highlighting that although emotion perception and ToM share some common components, they nonetheless have distinct properties. Specifically, basic emotion perception depends on a limited brain network, whereas classic ToM tasks depend on more complex neural interconnections. Oakley et al. (2016) similarly argued that emotion recognition and mental state inference are discrete cognitive processes, while Fitzpatrick et al. (2018) found that facial emotion recognition and ToM were not significantly correlated in their sample of adolescents with and without Autism Spectrum Disorder (ASD). Based on arguments that affective ToM and emotion recognition represent distinct constructs, we excluded studies of emotion recognition from the current review. Notably, a previous meta-analysis has already shown that psychopathic traits are associated with impaired recognition of others' emotions, primarily from facial expression stimuli, and that this effect was more generalized and not specific to a particular emotion (e.g., fear or sadness) (Dawel et al., 2012).

Consistent with the somewhat complex nature of empathy, different theoretical models have proposed distinct hypotheses about the association between psychopathic personality traits and different components of empathic functioning. For example, some authors have argued that psychopathy is associated with an impaired ability to feel what another is feeling (i.e., problems in affective empathy), and problems in learning to associate harmful or violent acts with another's distress, but a relative competency in inferring others' mental states (Blair, 2008; Blair, 2013; Blair and Lee, 2013). A recent review by Campos et al. (2022) examined associations of psychopathic personality and antisocial personality disorder with empathic functioning, and concluded that distinct psychopathy trait dimensions (e.g., interpersonal, affective) are differentially associated with both cognitive and affective components of empathy. In a separate review, Burghart and Mier (2022) examined the association of psychopathic traits with responses on the Interpersonal Reactivity Index (Davis, 1983), and the Toronto Alexithymia Scale-20 (Bagby et al., 1994), finding a negative relationship between psychopathy and empathy, with the size of the relationship being found to vary between different psychopathy trait dimensions. Although the IRI includes four

distinct subscales: empathic concern, perspective taking, personal distress, and fantasy, the IRI is incompatible with more modern definitions of cognitive and affective empathy (Reniers et al., 2011).

A lack of clarity in the relationship between psychopathy and ToM may result from various problems. For example, although abundant tasks have been developed to assess ToM ability, many of the classic tests lack specificity, and instead rely on several possibly inter-related skills (Quesque and Rossetti, 2020). In an effort to resolve these definitional and measurement issues, a more stringent definition of ToM has been proposed, which states that ToM tasks should meet two basic criteria: (1) the task should necessitate representing mental states (i.e., mentalizing); (2) the task should necessitate distinguishing one's own mental state from the mental states of others (Quesque and Rossetti, 2020). This more stringent definition calls for some recalibration and would exclude tasks that have generally been considered to measure ToM ability.

One example of this problem is the widely used Reading the Mind in the Eyes Test (RMET), which was developed by Baron-Cohen et al. (2001), and requires participants to match emotion and mental state descriptor words based on the images of the eye region of faces. Although this task has historically been used to measure (affective) ToM, some researchers suggest that the RMET is better defined as a measure of affect recognition (Oakley et al., 2016). Despite this debate, the RMET remains in common use as a performance-based measure of ToM, and has been included in meta-analyses examining ToM impairment in schizophrenia (Bora et al., 2009; Sprong et al., 2007), psychosis (Bora and Pantelis, 2013), major depressive disorder (Bora and Berk, 2016), bipolar disorder (Bora et al., 2016), and attention-deficit/hyperactivity disorder (Bora and Pantelis, 2016). To navigate these problems in the current review, we aimed to conduct two meta-analyses: one using a more general, broader definition of ToM that would allow for comparison with effect sizes in other areas of psychopathology, and one using the more stringent definition proposed by Quesque and Rossetti (2020).

It is also important to consider that ToM ability improves with increasing age, including as people age through adulthood (Peterson and Wellman, 2019), with adolescence being a crucial period for the development of a mature ToM (Meinhardt-Injac et al., 2020). It is possible, therefore, that the association of psychopathic traits with ToM task performance may vary with developmental stage. According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed; DSM-5; American Psychiatric Association, 2013), one has to be aged 18 and above to meet the criteria for a personality disorder, yet research suggests that psychopathy has its roots in childhood (Lynam et al., 2007). Psychopathic traits, or their precursors (e.g., callous-unemotional traits, conduct problems), can be reliably identified in childhood and adolescence, are relatively stable throughout the lifespan (Frick and Kemp, 2021), and are predictive of later outcomes including increased criminality and violence that carry considerable societal and economic costs (Hollenshead et al., 2020). Callous-unemotional (CU) traits, the childhood analogue of psychopathy, include aggression, antisocial behaviors, and other psychopathic trait-like behaviors. These traits co-occur in 25–50% of children with conduct disorders (Frick and Viding, 2009), and their co-occurrence with conduct disorder predicts a higher likelihood of presenting with antisocial behaviors in adulthood (Barry et al., 2000; Frick, 1998a, 1998b; Frick et al., 2000).

The overarching aim of this study was to estimate the consistency and strength of the relationship of psychopathic traits with ToM task performance, and to explore how heterogeneity in this relationship may be accounted for by: (1) age (child/adolescent versus adult); (2) type of sample (incarceration facilities/forensic settings/psychiatric institutions versus community); (3) format of psychopathy measurement tool (clinician rating scale versus self-report questionnaire); (4) psychopathy measurement tool structure/conceptualization (PCL two-factor/four-facet structure versus other psychopathy structures such as the three-dimensional structure); (5) psychopathy trait dimensions (Factor 1 or interpersonal/affective traits versus Factor 2 or lifestyle/antisocial traits); (6) type of ToM tasks (cognitive versus affective ToM); (7) inclusion of RMET as a ToM task; (8) whether the ToM tasks used have met the more stringent criteria offered by Quesque and Rossetti (2020), or a more general, broader definition referred to in this review as 'broadly defined' ToM.

To our knowledge, this is the first attempt to systematically review and quantitatively synthesize the relationship of psychopathic traits specifically with ToM task performance (including cognitive and affective ToM, and differentiating between a broader versus more stringent definition of ToM), helping to provide a more conclusive understanding and summary of existing work. A more precise understanding of the association of psychopathic personality with ToM task performance, and the factors that moderate this relationship, will also aid decision-making about interventions that incorporate ToM and mentalizing-based approaches in the rehabilitation of people with psychopathy and conduct problems (Fonagy et al., 2020).

2. Method

2.1. Search strategy

We preregistered our protocol and analysis strategy on PROSPERO (CRD42020184801; https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=184801). Our literature search was guided by the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher et al., 2009). Literature searches were conducted on 16 April 2021 and were updated on 27 January 2022 and 7 November 2022. Records were identified by systematically searching the following three electronic databases: PubMed, Scopus, and Web of Science Core Collection. There were no restrictions on date. The following key words were used: theory of mind, mentalising, mentalizing, social cognition, perspective taking, mentalisation, mentalization, false belief, faux pas, faux-pas, mental state, cognitive empathy, antisocial personality disorder, callous, conduct disorder, psychopathy, psychopath, psychopathic, unemotional, and callous-unemotional (cu) traits.

2.2. Eligibility criteria

To be eligible for inclusion, studies had to: (1) focus on examining the association between psychopathic traits and broadly defined ToM ability; (2) use validated self-report or clinical rating instruments to assess psychopathy; (3) include a task-based measure of ToM; (4) be published in peer-reviewed journals in English language. Studies of developmental (i.e., children and adolescents) and adult samples, and studies that recruited samples from forensic settings (i.e., prisons, individuals that have been charged with or convicted of criminal offences), clinical settings (i.e., psychiatric hospitals, individuals that have been diagnosed with mental disorders), and the community (i.e., individuals that do not meet the criteria for forensic or clinical samples) were all eligible for inclusion. Studies using samples with intellectual disabilities, learning disabilities (e.g., IQ lower than 70), or developmental disorders (e.g., autism spectrum disorder) were all excluded from this study as the presence of these could have an impact on ToM task performance (Ashcroft et al., 1999; Cardillo et al., 2018; Smogorzewska et al., 2019).

2.3. Outcome measures

All studies were required to have a performance-based ToM outcome measure with responses scored as correct or incorrect. Broadly defined, ToM tasks included those that measured the ability to identify or recognize another's mental state or take another's perspective, while tasks meeting Quesque and Rossetti (2020)'s more stringent definition for ToM had to examine the ability to represent mental states, and the ability to distinguish one's own mental state and the mental states of others. We excluded tasks that relied on correctly categorizing basic

emotional facial expressions (for a review of psychopathy and emotional expression recognition see Dawel et al., 2012), or only reported reaction times in the absence of accuracy.

2.4. Study selection

One reviewer performed the initial screening (i.e., titles and abstracts), and examined the remaining full texts. All full texts were also independently screened for inclusion by a second reviewer. Disagreements were usually resolved between the two reviewers. In cases where agreement could not be reached, a third reviewer was consulted. Altogether, there were four disagreements. On each occasion, the disagreement was resolved after a discussion between the first author and the senior author.

2.5. Data extraction

Data extraction was completed by one reviewer. Three other reviewers each cross-checked data extraction for 10% of the included studies and a fourth reviewer cross-checked all data for accuracy. Data extracted from each study included: (1) Publication details: author, title, year; (2) Design: type of study (correlational or case-control), type of sample (clinical, forensic, or community); (3) Participant details: gender, age, ethnicity, education level; (4) Outcome measures: sample size, psychopathy measurement and scores, type of ToM task and data used for calculating the effect sizes (e.g., means and SD for between-group designs, Pearson's r for correlational studies). Titles and abstracts were exported into Endnote for screening, while decisions related to inclusion or exclusion for full-text screening were recorded in an Excel file. Where sufficient information was not provided, study authors were contacted and asked to provide further information.

2.6. Quality assessment and risk of bias

To assess the quality as well as the risk of bias of all included items, the Appraisal tool for Cross-Sectional Studies (AXIS tool; Downes et al., 2016) was used. The AXIS tool includes 20 questions which mainly focus on the presented methods and results. The responses to the questions are categorical ('yes', 'no', 'do not know'), meaning the tool does not provide a numerical score. The methodological quality was based on an overall consideration of areas of strengths and weaknesses.

2.7. Statistical analysis

Multi-level random effects meta-analyses were conducted. The random effects model was chosen to account for both within-study and between-study variation, and substantial heterogeneity among the studies being analyzed (Borenstein et al., 2009). We used multi-level meta-analyses as most studies provided more than one effect size (e.g., different measures of broadly defined ToM), and this allowed us to take account of the fact these effects are not independent (Fernández-Castilla et al., 2020). There were two types of studies that were included in our searches: case-control designs and correlational study designs. For correlational study designs, we extracted the sample size, and the correlation between psychopathy and theory of mind task performance. For case-control design studies, Standardized Mean Difference (SMD) effect sizes were calculated using the 'escalc' function of the 'metafor' package (Viechtbauer, 2010). The SMDs were then converted to correlations using the 'd_to_r' function from the 'effectsize' package. For all analyses, Fisher's transformation was conducted on the correlations to normalize the distributions.

To examine the robustness of the primary analysis, we identified any outliers using the 'boxplot' function in R and re-ran the model with these excluded. We also conducted a Trim and Fill analysis on a single level model to identify: (1) the number of studies needed to impute to achieve funnel plot symmetry; and (2) the pooled effect after adjusting for these imputed studies. Finally, we examined any influential cases using the 'influence' command.

I^2 was calculated to compare heterogeneity among studies. To interpret I^2, we refer to Borenstein et al. (2017) where "if I^2 is near zero, then most of the observed variance would disappear if looking at the true effects. If I^2 is near one, then most of the observed variance would remain" (Borenstein et al., 2017, p.3). To investigate the effect of confounding variables and resolve any heterogeneity, we examined the impact of: age (child/adolescent versus adult), type of sample (incarceration facilities/forensic settings/psychiatric institutions versus community), format of psychopathy measurement tool (clinical rating scale versus self-report questionnaire), psychopathy measurement tool structure (two-factor/four-facet structure versus other psychopathy structures such as the three-dimensional structure), psychopathy trait dimensions (Factor 1 or interpersonal/affective traits versus Factor 2 or lifestyle/antisocial traits), type of ToM tasks (cognitive versus affective), the inclusion of RMET (RMET versus other ToM tasks), and the use of the more stringent definition of ToM proposed by Quesque and Rossetti (2020), using subgroup analyses. A negative effect size indicates that increasing psychopathy scores are associated with worse ToM task performance. Finally, we explored the statistical power of the studies to detect the pooled effect and provide guidance for future researchers in determining their sample size. A significance level of 0.05 was set for all analyses. Data and analysis scripts can be found on OSF [https://osf.io/q5vd3/?view_only= 34dd3730bcc24be1a9a8feecb459d323].

3. Results

3.1. Search results

The search strategy and number of studies retained at each level are outlined in Fig. 1. The primary search yielded 1622 studies, with 42 studies retained for inclusion in the review, all of which were published in peer-reviewed journals between 1996 and 2022, with a total sample size of 7463 participants.

Population characteristics for case-control studies are reported in Table 1 and for correlational studies in Table 2. The total sample size ranged from 28 to 1000. For studies with between-group designs, where reported, comparisons with community and clinical control groups are included separately in the multi-level meta-analysis (nested within studies).

3.2. Quality assessment and risk of bias

One reviewer appraised the quality of all included studies. Overall, all studies were of good quality. No studies were excluded based on quality appraisal. Full quality appraisal details can be found in Supplementary material.

Most studies presented solid justifications with clearly stated aims/objectives. Basic data were also adequately described, and the conclusions were justified by the results. Common limitations across most papers included missing justifications for sample size, and limited or no description of the process used for evaluating non-responders, and differences between responders and non-responders.

3.3. Meta-analytic models

3.3.1. Primary analysis

The Association Between Broadly Defined Theory of Mind and Psychopathy. One hundred and forty-two effect sizes from 42 studies were included in the model. The multilevel model was a better fit than a single level model (Loglikelihood ratio test = 20.38, $p < 0.001$). There was a significant negative association between psychopathy and broadly defined ToM task performance ($r = -0.126$ [95% CI: −0.168 to −0.083], $Z = 5.82$, $p < 0.001$, $I^2 = 79.2\%$; see Fig. 2). A pooled r of −0.126 suggests a small negative correlation between psychopathy and

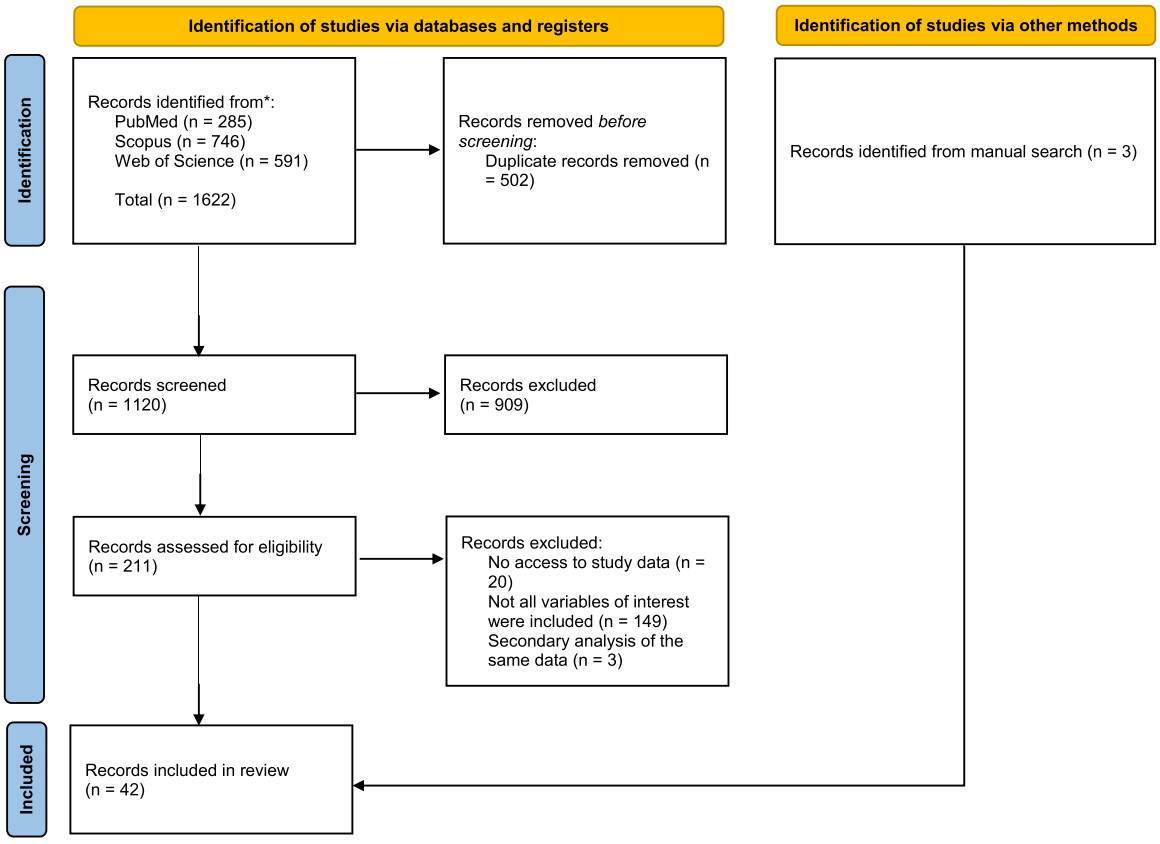

Fig. 1. The PRISMA Flow Chart for the Study Selection Process.

broadly defined ToM task performance across the studies that were included in this meta-analysis.

Removal of three outlying effect sizes did not substantially influence the pooled association ($r = -0.113$ [95% CI: −0.152 to −0.075], $Z = 5.74$, $p < 0.001$, $I^2 = 75.6\%$). Two influential effect sizes were identified. Similarly, removal of the influential effect sizes did not substantially influence the pooled association ($r = -0.112$ [95% CI: −0.150 to −0.075], $Z = 5.82$, $p < 0.001$, $I^2 = 73.3\%$). A Trim and Fill analysis on a single level model demonstrated that 20 effect sizes would be needed to achieve symmetry, which would increase the pooled negative association to $r = -0.164$ [95% CI: −0.193 to −0.135], see Fig. 3. Overall, there was a small but robust association between psychopathy and broadly defined ToM task performance, with increases in psychopathy associated with poorer performance in broadly defined ToM tasks.

3.3.2. *Moderator analyses*

A summary of moderator analyses is shown in Fig. 4.

Age – Adult versus Child/adolescent. Due to small numbers of studies that recruited children but not adolescents, and vice versa, for methodological purposes we decided to collapse the child and adolescent groups to compare with the adult group. Eleven effect sizes (5 studies) were excluded from this analysis due to missing data or mixed age samples. The pooled association in adult samples (93 effects / 26 studies) was $r = -0.147$ ([95% CI: −0.198 to −0.097], $p < 0.001$), and in child/adolescent samples (38 effects / 11 studies) was $r = -0.111$ ([95% CI: −0.181 to −0.041], $p = 0.002$). There was no significant moderator effect ($X^2(1) = 0.534$, $p = 0.465$).

Sample Type – Incarceration facilities/forensic settings/psychiatric institutions versus Community**.** Due to methodological reasons, we collapsed samples from incarceration facilities, forensic settings, and psychiatric institutions into a single category for comparison with studies that recruited community samples. We also excluded 9 studies that used a mixed sample of participants from incarceration facilities/forensic settings and community. The pooled association for samples from incarceration facilities/forensic settings/psychiatric institutions (42 effects / 14 studies) was $r = -0.107$ ([95% CI: −0.237 to 0.023], $p = 0.106$), and in community samples (56 effects / 19 studies) was $r = -0.170$ ([95% CI: −0.218 to −0.123], $p < 0.001$). There was no significant moderation effect ($X^2(1) = 1.392$, $p = 0.238$).

Self-report versus Clinician Rating (i.e., PCL-R, PCL:SV). The pooled association for studies that used questionnaire-based self-report measures of psychopathy (95 effects / 28 studies) was $r = -0.129$ ([95% CI: −0.175 to −0.083], $p < 0.001$), and in clinical ratings (50 effects / 16 studies) was $r = -0.123$ ([95% CI: −0.213 to −0.034], $p = 0.007$). There was no significant moderation effect ($X^2(1) = 0.042$, $p = 0.838$).

PCL 2-factor/4-facet Conceptualization versus Other Conceptualization. One study (Shamay-Tsoory et al., 2010) (4 effects) was excluded from this moderator analysis as the study used both PCL based measures as well as other instruments to categorize participants into groups. The pooled association in studies that used PCL-based measures (i.e., the PCL-R, the PCL:SV, the PCL:YV, the SRP) (54 effects / 20 studies) was $r = -0.117$ ([95% CI: −0.191 to −0.042], $p = 0.002$), and for other psychopathy measurement tool structures was (84 effects / 26 studies) was $r = -0.136$ ([95% CI: −0.187 to −0.084], $p < 0.001$). There was no significant moderation effect ($X^2(1) = 0.139$, $p = 0.709$), suggesting that the effect size was invariant across different psychopathy measurement tool structures/conceptualizations.

Interpersonal/Affective versus Lifestyle/Antisocial Psychopathic Traits. A list of classifications of interpersonal/affective traits and lifestyle/antisocial traits for different psychopathy measurement tools is summarized in Table 3. The pooled association for interpersonal/affective traits (69 effects / 14 studies) was $r = -0.130$ ([95% CI: −0.191 to −0.069], $p < 0.001$), and for lifestyle/antisocial traits (24 effects / 10 studies) was $r = -0.112$ ([95% CI: −0.192 to −0.033], $p = 0.006$). There was a significant moderation effect ($X^2(1) = 4.362$,

Table 1
Sample Characteristics for Case-control Studies.

Study	% White	% Male	Country	Age Group	Sample Type	Psychopathy Measurement	Psychopathy Subscale	Sample Size	ToM task	ToM Type	Psychopathy Group n	Control Group n
Blair et al. (1996)	n.s.	n.s.	UK	Adults	Incarceration facility & Forensic setting	PCL-R	Total score	50	Story Interpretation	Cognitive	25	25
Richell et al. (2003)	n.s.	100	UK	Adults	Forensic setting	PCL-R	Total score	37	RMET	Affective	19	18
Dolan and Fullam (2004)	n.s.	100	UK	Adults	Mixed	PCL-SV	Total score	85	Faux pas	Mixed	28	57
								84	RMET	Affective	28	56
Jones et al. (2010)	n.s.	100	UK	Adolescents/ children	Mixed	ICU teacher report	Total score	44	First- and second-order ToM	Cognitive	21	23
								44	Animation Task	Mixed	21	23
Sommer et al. (2010)	n.s.	n.s.	Germany	Adults	Incarceration facility	PCL-R	Total score	28	Cartoon stores	Affective	14	14
Schwenck et al. (2012)	n.s.	100	Germany	Adolescents/ children	Mixed	ICU parent report	Total score	70	Animation task	Mixed	36	34
								70	Video sequence task	Affective	36	34
Sebastian et al. (2012)	74.5	100	UK	Adolescents/ children	Community	ICU	Total score	47	Cartoon task	Mixed	31	16
Domes et al. (2013)	n.s.	100	Germany	Adults	Mixed	PCL-R	Total score	57	RMET	Affective	28	29
								57	MET	Affective	28	29
Nentjes et al. (2015)	n.s.	100	Netherlands	Adults	Mixed	PCL-R	Total score	76	RMET	Affective	39	37
Nentjes et al. (2015)	n.s.	100	Netherlands	Adults	Mixed	PCL-R	Total score	82	ATTM	Cognitive	42	40
Schiffer et al. (2017)	n.s.	100	Germany	Adults	Mixed	PCL-SV	Total score	36	RMET	Affective	18	18
Drayton et al. (2018)	35.8	100	US	Adults	Incarceration facility	PCL-R	Total score	50	Faux Pas	Affective	22	28
Roberts et al. (2020)	51.9	100	UK	Adolescents/ children	Community	ICU	Total score	54	MASC	Mixed	28	26

Note. n.s. = not stated. ATTM = Advanced Test of Theory of Mind. ICU = Inventory of Callous-unemotional traits. MASC = Movie Assessment of Social Cognition. MET = Multifaceted Empathy Test. PCL-R = Psychopathy Checklist Revised. PCL-SV = Psychopathy Checklist: Screening version. RMET = Reading the Mind in the Eyes Test.

Table 2
Sample Characteristics for Correlational Studies.

Study	% White	% Male	Country	Age Group	Sample	Sample Size	Psychopathy Measurement	Psychopathy Subscale	ToM Task	ToM Type
Ali and Chamorro-Premuzic (2010)	n.s.	17.9	UK	Adults	Community	112	LSRP	Primary, Secondary	RMET	Affective
									RMVT	Affective
Shamay-Tsoory et al. (2010)	n.s.	100	Israel	Adults	Mixed	37	SRP-II	Total score	Yoni	Mixed
							LSRP-III	Total score		
Brook and Kosson (2013)	32.0	100	US	Adults	Forensic setting	103	PCL-R	Total score, factor 1 & 2, interpersonal, affective, lifestyle, antisocial	Cognitive empathy task	Affective
Lockwood et al. (2013)	n.s.	50.0	UK	Adults	Community	110	SRP-4-SF	Total score	Animation task	Mixed
Stellwagen and Kerig (2013a)	66.0	62.0	US	Adolescents/ children	Psychiatric institution	100	APSD	CU traits	ATTM	Cognitive
Stellwagen and Kerig (2013b)	82.0	42.0	US	Adolescents/ children	Community	146	APSD	CU traits	ATTM	Cognitive
van Zwieten et al. (2013)	n.s.	31.9	Australia	15–26 years old	Psychiatric institution	91	APSD	Total score	RMET	Affective
Mier et al. (2014)	n.s.	100	Germany	Adults	Mixed	29	PCL-R	Total score	Affective ToM tasks	Affective
							German version PPI	Total score		
Sandvik et al. (2014)	n.s.	100	Norway	Adults	Forensic setting	80	PCL-R	Total score, factor 1 & 2	RMET	Affective
							SRP-III	Total score, factor 1 & 2		
Sharp and Vanwoerden (2014)	82.3	38.5	US	Adolescents/ children	Psychiatric institution	342	APSD	CU traits	MASC	Mixed
							ICU	Callous, uncaring, unemotional	CET	Affective
							YPI	Interpersonal, affective, lifestyle		
Abu-Akel et al. (2015)	n.s.	19.0	Denmark	Adults	Incarceration facility	79	PCL-R	Total score	MAS-A	Cognitive
Vonk et al. (2015)	76.0	17.8	US	Adults	Community	929	LSRP	Primary, secondary	RMET	Affective
									STEM	Cognitive
									STEU	Affective
									Hinting	Cognitive
									The imposing memory test	Cognitive
Centifanti et al. (2016)	n.s.	0	UK	Adolescents/ children	Community	96	YPI	Total score	Cognitive ToM tasks	Cognitive
de la Osa et al. (2016)	90.7	49.8	Spain	Adults	Community	538	ICU	Total score, callous, unemotional, uncaring	Yoni	Mixed
Lui et al. (2016)	57.3	70.0	US	Adolescents/ children	Community	103	ICU	Total score	Affective perspective taking task	Affective
Oliver et al. (2016)	n.s.	40.0	Canada	Adults	Community	90	PPI-R	Coldheartedness	MET	Affective
Song et al. (2016)	85.0	51.0	US	Adolescents/ children	Community	241	Child Behavior Checklist	CU traits	False belief prediction and explanation tasks - revised	Cognitive
Gillespie et al. (2017)	n.s.	29.1	UK	Adults	Community	55	LSRP	Total score, primary, secondary	MASC	Mixed
Kahn et al. (2017)	14.0	100	US	12–20 years old	Forensic setting	107	ICU	Total score	Cognitive ToM	Cognitive
									Affective ToM	Affective
Foell et al. (2018)	80.0	27.5	US	Adults	Community	80	TriPM	Total score, boldness, meanness, disinhibition	MET	Affective
Pajevic et al. (2018)	n.s.	43.4	Serbia	Adults	Community	576	SRP-SF	Total score	RMET	Affective
Schimmenti et al. (2019)	n.s.	45.0	Italy	Adults	Community	799	Italian version Dark Triad Dirty Dozen[a]	Psychopathy	RMET	Affective
Gillespie et al. (2020)	n.s.	100	Denmark	Adolescents/ children	Forensic setting	80	PCL-YV	Total score	RMET	Affective
Kajonius and Bjorkman (2020)	n.s.	35.0	Sweden	16–69 years old	Community	278	SD3	Psychopathy	MET	Affective
Carroll et al. (2021)	n.s.	100	UK	Adults	Community	1000	LSRP	Primary, secondary	RMET	Affective
Remmel et al. (2022)	24.4	100	US	Adults	Forensic setting	87	PCL-SV	Total score, factor 1 & 2	Faux pas	Mixed

(*continued on next page*)

Table 2 (*continued*)

Study	% White	% Male	Country	Age Group	Sample	Sample Size	Psychopathy Measurement	Psychopathy Subscale	ToM Task	ToM Type
Flórez et al. (2022)	n.s.	n.s.	Spain	n.s.	Forensic setting	204	PCL-R	Total score, factor 1 & 2, interpersonal, affective, lifestyle, antisocial	RMET	Affective
van Dongen et al. (2022)	n.s.	52.4	Netherlands	16–66 years old	Community	105	TriPM	Total score, boldness, meanness, disinhibition	Faux pas	Mixed
Weinstein et al. (2022)	n.s.	51.3	US	Adults	Community	150	TriPM	Total score, boldness, meanness, disinhibition	Dot task MASC	Cognitive Mixed

Note. n.s. = not stated. APSD = Antisocial Process Screening Device. ATTM = Advanced Test of Theory of Mind. CET = Child's Eye Test. ICU = Inventory of Callous-unemotional traits. LSRP = Levenson Self-Report Psychopathy Scale. LSRP-III =Leveson Self-Report Psychopathy Scale: Version III. MAS-A = Metacognition Assessment Scale-Abbreviated Version. MASC = Movie Assessment of Social Cognition. MET = Multifaceted Empathy Test. PCL-R = Psychopathy Checklist Revised. PCL-SV = Psychopathy Checklist: Screening version. PCL-YV = Psychopathy Checklist: Youth Version. PPI = Psychopathic Personality Inventory. PPI-R = Psychopathic Personality Inventory – Revised. RMET = Reading the Mind in the Eyes Test. RMVT = Reading the Mind in the Voice Test. SD3 = Short Dark Triad. SRP-II= Self-Report Psychopathy scale II. SRP-III = Self-Report Psychopathy scale III. SRP-4-SF = Self-Report Psychopathy Scale-Short Form. STEM = Situational Test of Emotion Management. STEU = Situational Test of Emotion Understanding. TriPM = Triarchic Psychopathy Measure. YPI = Youth Psychopathic Inventory.

[a] Dark Triad Dirty Dozen (DTDD): a 12-item questionnaire designed to measure three distinct but related personality traits known as the "Dark Triad", namely Narcissism, Machiavellianism, and Psychopathy (Jonason and Webster, 2010). When the Dark Triad is used (i.e., DDTD and SD3), we only consider results relating to the psychopathy traits.

$p = 0.037$), with interpersonal/affective psychopathic traits associated with the greatest impairment in ToM task performance.

Three-dimensional Models of Psychopathic Traits. An insufficient number of studies reported results separately for the three psychopathy trait dimensions (i.e., interpersonal/boldness, affective/meanness, impulsive/disinhibition). Only one study reported data for all YPI facets, and three studies reported data for all TriPM dimensions.

Cognitive versus Affective ToM. We excluded studies using ToM tasks that did not provide separable effects sizes for cognitive and/or affective ToM (i.e., where the effect size reflected a mixture of cognitive and affective performance). The pooled association for cognitive ToM (42 effects / 11 studies) was $r = -0.146$ ([95% CI: −0.236 to −0.056], $p = 0.001$), and for affective ToM (84 effects / 25 studies) was $r = -0.118$ ([95% CI: −0.163 to −0.071], $p < 0.001$). There was no significant moderation effect ($X^2(1) = 0.147$, $p = 0.701$).

RMET versus Other ToM Tasks. The pooled association for RMET (39 effect sizes / 14 studies) was $r = -0.134$ ([95% CI: −0.199 to −0.070], $p < 0.001$), and for other ToM tasks (103 effects / 31 studies) was $r = -0.122$ ([95% CI: −0.173 to −0.070], $p < 0.001$). There was no significant moderation effect ($X^2(1) = 0.068$, $p = 0.795$).

ToM with a stringent definition. Quesque and Rossetti (2020) suggest that classic ToM tasks lack specificity and propose that any test of ToM must fulfill two criteria: (1) the task should necessitate representing mental states (i.e., mentalizing); (2) the task should necessitate distinguishing one's own mental state from the mental states of others. A list of tasks included in this meta-analysis and whether they have met the criteria (based on guidance provided in Quesque and Rossetti, 2020), is summarized in Table 4.

The pooled association for tasks that met the more stringent criteria for ToM (55 effects / 19 studies) was $r = -0.112$ ([95% CI: −0.179 to −0.045], $p = 0.001$) and $r = -0.135$ ([95% CI: −0.188 to −0.081], $p < 0.001$) for those that did not meet the more stringent criteria for ToM (87 effects / 29 studies). There was no significant moderation effect ($X^2(1) = 1.187$, $p = 0.276$).

3.4. Statistical power

Given the pooled association of $r = -0.126$, the median power across all the studies to detect this effect size was ~21.8% (min ~ 6.4%, max ~ 97.8%). To reliably detect an association (one-tailed, alpha =0.05) of $r = -0.126$, approximately 388 participants are needed for 80% power, and 536 participants are needed for 90% power.

4. Discussion

We conducted a systematic review and meta-analysis of 42 studies involving 7463 participants to establish the consistency and strength of the association between psychopathic traits and ToM task performance. We also explored the effects of possible moderators (i.e., age, type of sample, format of psychopathy measurement tool, psychopathy measurement tool structure/conceptualization, psychopathy traits dimensions, types of ToM tasks, inclusion of RMET as a ToM task, and the use of a more stringent definition of ToM). When using a more general definition of ToM, we found a significant negative association between psychopathic traits and ToM task performance (pooled $r = -0.126$), which indicated that increasing psychopathic traits were associated with an impaired ability to understand others' thoughts, feelings, intentions, and beliefs. This effect size is smaller than other meta-analytic effect sizes for ToM impairment in schizophrenia ($rs = 0.48$–0.53) (Bora et al., 2009; Sprong et al., 2007), first episode psychosis ($r = 0.45$) (Bora and Pantelis, 2013), major depressive disorder ($r = 0.28$) (Bora and Berk, 2016), bipolar disorder ($r = 0.3$) (Bora et al., 2016), and attention-deficit/hyperactivity disorder ($r = 0.21$) (Bora and Pantelis, 2016). Nonetheless, the effect size observed here is likely to be of some explanatory and practical use at the level of single events and could be consequential in the long run (Funder and Ozer, 2019). The results of

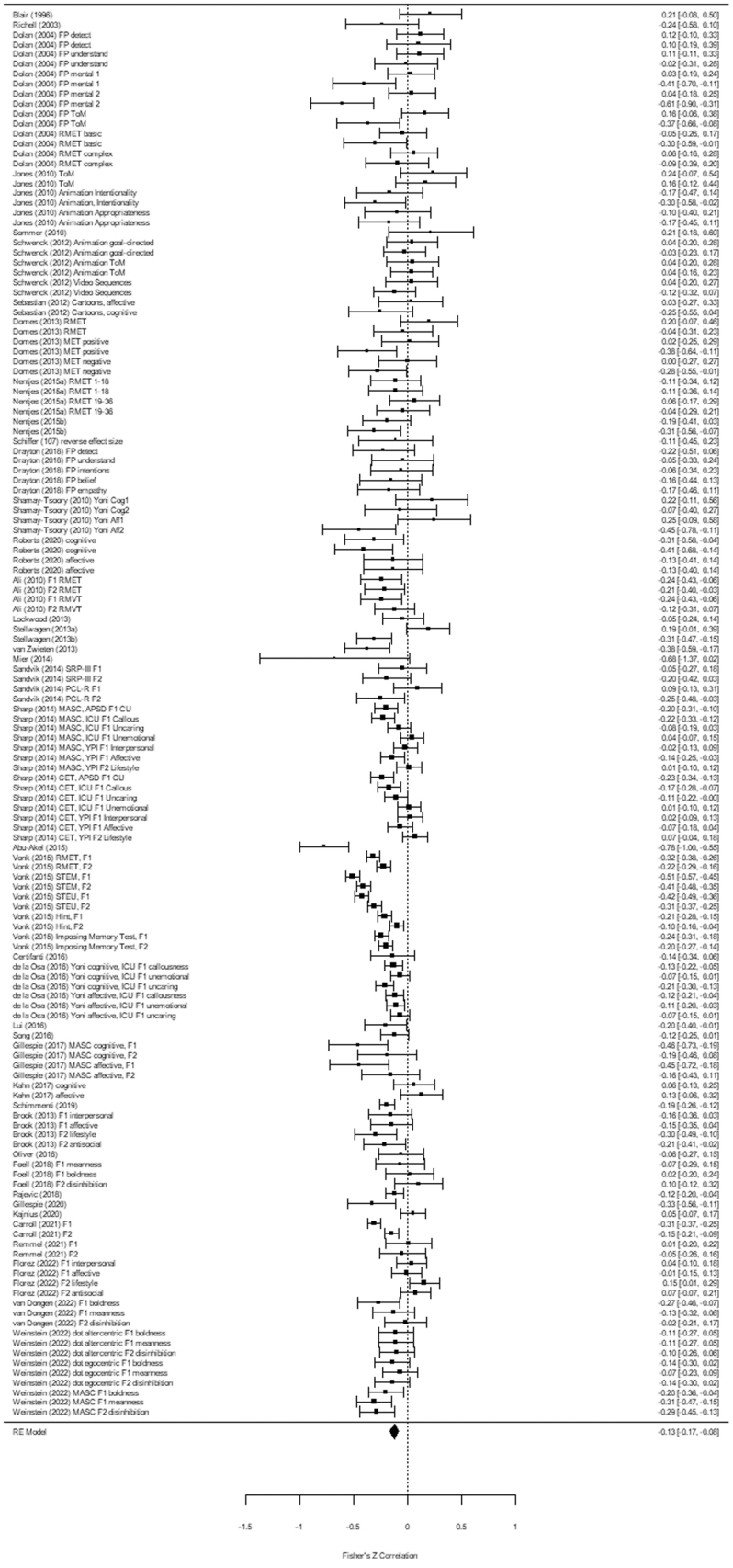

Fig. 2. Forest Plot of Study and Multilevel Model Mean Effect Sizes for Theory of Mind in Psychopathy.

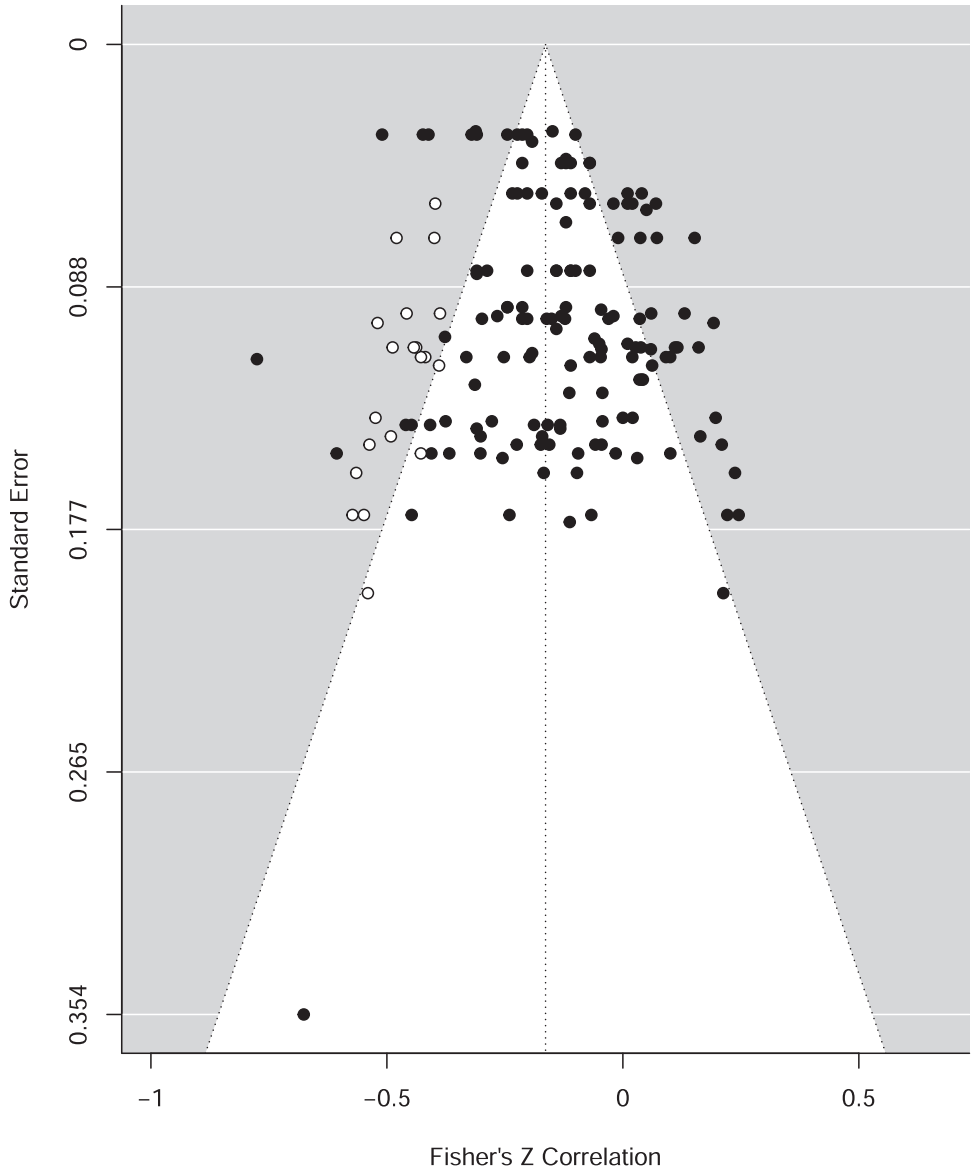

Fig. 3. Funnel Plot of the Study.

meta-analyses highlighting ToM impairment in other disorders raises an important methodological point about the potential impact of co-occurring traits and comorbid disorders. For instance, recent studies examining the co-occurring effects of psychopathic tendencies and psychotic symptoms have suggested a beneficial effect of comorbidity on social cognitive abilities compared to experiencing symptoms of either disorder alone (Abu-Akel et al., 2015; Gillespie et al., 2020; Gillespie et al., 2017). Such effects of comorbidity could represent potential confounders when examining the relationship between ToM abilities and psychopathy alone, and future work should try to account for the influence of comorbid traits and disorders.

A non-significant Egger's test suggested that the effects of publication bias were minimal. Despite a high degree of heterogeneity (I^2 = 79.2%), the finding was robust against outliers, and a series of moderator analyses showed that age, type of sample, format of psychopathy measurement tool, psychopathy measurement tool structure/conceptualization, types of ToM tasks, and inclusion of RMET, did not moderate the association. We also found that effect sizes were similar whether ToM was defined using more general criteria or using the more stringent criteria proposed by Quesque and Rossetti (2020). However, the moderator effect of psychopathic trait dimensions (i.e., interpersonal/affective traits versus lifestyle/antisocial traits) was significant, with interpersonal/affective traits associated with the greatest impairment in ToM task performance.

Psychopathy, like other personality disorders, is diagnosed only in adults, but childhood analogues of psychopathic traits have also been identified. Although ToM continues to develop through childhood and into adolescence and adulthood, our findings suggest that the association of psychopathic traits with broadly defined ToM task performance was similar in adult and adolescent/child samples. This finding is important, as it suggests that changes in social and emotional functioning through different stages of development do not buffer against the adverse effects of psychopathic traits on ToM ability. One recent study suggested that emotion understanding is important for broadly defined ToM development in children with low CU traits (Satlof-Bedrick et al., 2019), but that children with high CU traits appear to develop an intact broadly defined ToM despite difficulties in emotion understanding. Based on the current literature on psychopathy and ToM, our findings do not support the hypothesis that participants with elevated psychopathic traits develop alternative ways of understanding people's minds as they age into adulthood. It is possible that life experiences and other competencies could also impact on the association of psychopathic traits

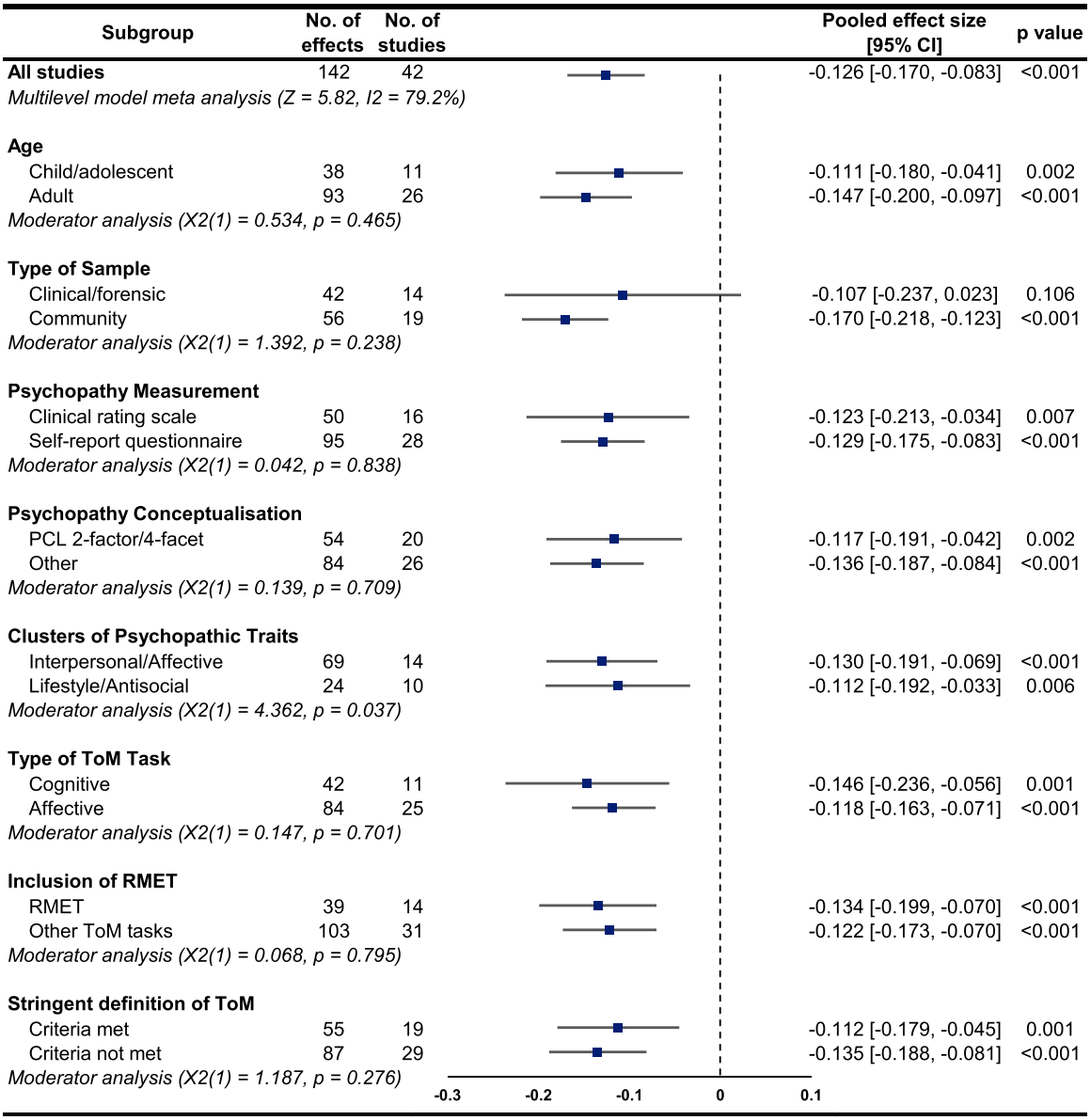

Fig. 4. Forest Plot for Subgroup Moderator Analyses.

with ToM task performance in both developmental and adult samples. The extent to which emotion regulatory capacity or experiences of childhood adversity and maltreatment impact on the relationship between psychopathy and ToM task performance is worthy of further investigation.

A non-significant moderator analysis suggested that although samples from incarceration facilities/forensic settings/psychiatric institutions tend to show more severely elevated psychopathic traits compared to the general population, the relationship of psychopathy with broadly defined ToM was consistent in both sample types. Our findings contrast with the results of a recent meta-analysis (Burghart and Mier, 2022), which showed a stronger relationship between psychopathic traits and empathic concern in community samples compared to correctional/clinical samples. Our finding of similar effects in incarceration facilities/forensic settings/psychiatric institutions and community samples is consistent with the dimensional nature of psychopathic traits, and with the finding that results in clinical or forensic samples are often paralleled in non-clinical samples, despite marked differences in prevalence (20–30% in prison vs. 1% in the general population) (Edens et al., 2006; Guay et al., 2007; Seara-Cardoso and Viding, 2015). Based on this evidence, it is perhaps unsurprising that the association of psychopathy with broadly defined ToM is similar in both groups.

The relationship of psychopathic traits with broadly defined ToM was also consistent for studies that employed clinical rating scales (e.g., PCL-R) or self-report questionnaires (e.g., TriPM) for the assessment of psychopathic traits, and was also found to be independent of whether the psychopathy measurement tool employed the PCL two-factor/four facet structure (e.g., the PCL-R, PCL:SV, the SRP), or employed a different factor structure (e.g., the TriPM). Thus, although different measurement tools with differing factor structures may differ in some respects (Evans and Tully, 2016), the scores derived using these differing assessment techniques are similarly associated with impaired ToM task performance. Our results suggest that although the total scores on different psychopathy instruments may not reflect identical conceptualizations of the psychopathy construct, these differences did not moderate the effect of psychopathic traits on ToM task performance. However, due to the limited number of studies, we were unable to compare PCL clinician ratings (e.g., PCL-R, PCL:SV) with self-reports using the PCL 2-factor/4-facet conceptualization.

Table 3
Operationalization of psychopathic traits into two types based on the 2-factor/4-facet psychopathy construct.

Psychopathy Measurement	Interpersonal/Affective Traits	Lifestyle/Antisocial Traits
APSD	Callous-unemotional	-
ICU	Callous Uncaring Unemotional	-
LSRP	Primary psychopathy	Secondary psychopathy
PCL-R	Factor 1 Interpersonal Affective	Factor 2 Lifestyle Antisocial
PCL-SV	Factor 1	Factor 2
PPI-R	Coldheartedness	-
SRP-III	Interpersonal Affective	Behavioral Criminal tendency
TriPM	Meanness Boldness	Disinhibition
YPI	Interpersonal Affective	Lifestyle

Note. APSD = Antisocial Process Screening Device. ICU = Inventory of Callous-unemotional traits. LSRP = Levenson Self-Report Psychopathy Scale. PCL-R = Psychopathy Checklist Revised. PCL-SV = Psychopathy Checklist: Screening version. PPI-R = Psychopathic Personality Inventory – Revised. SRP-III = Self-Report Psychopathy scale III. TriPM = Triarchic Psychopathy Measure. YPI = Youth Psychopathic Inventory.

We found that differing features of psychopathy that are broadly synonymous with either PCL-R Factor 1 (interpersonal/affective traits) or Factor 2 (lifestyle/antisocial traits) psychopathy did moderate the relationship between psychopathy and ToM. In particular, we showed that the cluster of interpersonal/affective psychopathic traits had a significantly larger pooled effect size than the cluster of lifestyle/antisocial traits. Our findings lend tentative support to results showing that the interpersonal/affective components of psychopathy represent the core of emotional and empathic deficits associated with psychopathy, and that deficits in ToM would tend to correlate more strongly with interpersonal/affective traits compared to lifestyle/antisocial traits (Hare and Neumann, 2008; Skeem and Cooke, 2010).

Perhaps somewhat surprisingly, the association of psychopathic traits with ToM task performance was similar for tests of cognitive versus affective ToM. Being competent at inferring another's thoughts, intentions, and beliefs (i.e., cognitive ToM) seems essential for manipulative and deceitful behaviors (Crick and Dodge, 1994), which represents a core characteristic of psychopathy (Hare, 1999). Accordingly, it has been suggested that while psychopathic traits may be associated with impairments in affective ToM (inferring the feelings and emotions of another), cognitive ToM may be relatively spared (inferring another's thoughts, intentions, and beliefs) (Blair, 2013; Blair and Lee, 2013). Brain imaging studies provide some support for this hypothesis, showing that psychopathy is associated with differential patterns of neural activity during affective perspective taking, but not cognitive perspective taking (Decety et al., 2013; Seara-Cardoso et al., 2016).

The finding that psychopathic traits are associated with similarly impaired performance on tests of cognitive and affective ToM calls into question the extent to which psychopaths' use of manipulation and deception reflects a more sophisticated cognitive ToM. Instead, our findings might suggest that individuals with elevated psychopathic traits operate under assumptions of others' mental states, or employ more shallow attempts at deception and flattery without truly understanding the mental state of the intended target. Anecdotally, at least some of the time, psychopaths' use of deception or flattery to manipulate others can appear exaggerated, shallow, or insincere. Future research should consider the extent to which these attempts at interpersonal manipulation achieve their intended goal and the extent to which the motives of psychopaths who engage in manipulative acts are considered to be genuine and sincere.

Consistent with Brook and Kosson's (2013) narrative review of the literature, it is suggested that existing results are not consistent with any single theoretical perspective. If substantiated, ToM difficulties are perhaps not a core part of what it means to be psychopathic, especially in comparison to other traits like dangerousness, which are more strongly related to psychopathic tendencies (Gillespie et al., 2022). It is also possible that potential differences in the relationship of psychopathic traits with cognitive versus affective ToM were masked by the inclusion of tasks that assessed a more broadly defined ToM construct, with performance on these tasks likely to be underpinned by several mechanisms required for social cognition more generally rather than ToM in particular (Quesque and Rossetti, 2020).

The problem outlined above is particularly pertinent to the inclusion of the RMET as an outcome measure for ToM task performance, with some debate as to whether the RMET is a measure of ToM or instead a measure of facial affect labelling (Oakley et al., 2016). A moderator analysis showed that although both RMET and other outcome measures showed a significant negative association with psychopathic traits, there was no significant difference between the two groups of tasks. This null result was also mirrored when we applied a more stringent definition of ToM proposed by Quesque and Rossetti (2020). Studies that used performance-based measures where success in the task could be attributed to lower-level processes rather than to mental state understanding (e.g., tasks relying on lower-level processes for emotion recognition), or where the task does not require one to distinguish between one's own and others' mental states, were contrasted with other outcome measures that satisfied both criteria. The results of this analysis showed no significant difference in the relationship between psychopathy and more broadly defined versus more stringently defined ToM task performance. These results may suggest that psychopathy is not only associated with more specific problems in representing the mental states of others, and/or distinguishing between one's own and others' mental states, but also with other aspects of social cognitive and affective functioning (e.g., affect recognition) that are required for successful performance on tests including the RMET (Quesque and Rossetti, 2020). Indeed, a meta-analysis of facial affect recognition has already shown that psychopathic traits are associated with impaired facial affect recognition (Dawel et al., 2012). In regard to emotion recognition, psychological constructionist theories contend that emotions are not merely automatically and readily perceived, but are recognized by the perceiver. In a review by Doyle and Lindquist (2017), it was hypothesized that conceptual knowledge supported by language is necessary for perceiving categories of emotions such as anger, disgust and fear on others' faces. According to the sensory inference hypothesis proposed by Barrett et al. (2007), language reactivates past sensory experiences related to emotions and changes the way the perceiver sees emotions on other people's faces. Our results may suggest that people with high psychopathic traits struggle to integrate emotion words with specific sensory information in ways that are required to recognize and understand others emotions.

Our results provide insight into potential interventions that may improve ToM task performance among people with elevated psychopathic traits. A randomized controlled trial investigated the efficacy of Mentalization-Based Treatment (MBT) in reducing anger, hostility, violence, and offending among individuals diagnosed with ASPD. The study's findings were positive, showing promising results in addressing these issues in this population (Fonagy et al., 2020). Although the concept of mentalization used in MBT encompasses other competencies (e.g., mindfulness, psychological mindedness, empathy, and affect consciousness) in addition to ToM (Choi-Kain and Gunderson, 2008), MBT nonetheless has been shown to enhance people's ability to identify and understand others' emotions and intentions, and as such could improve their social functioning and reduce the likelihood of engaging in antisocial behaviors. Given the results of our review, we suggest that the potential efficacy of MBT for improving ToM among people with high psychopathic traits should be explored.

Although our meta-analysis had several strengths, including pre-

Table 4
List of tasks used to estimate ToM and whether they met the more stringent criteria for ToM.

Study	ToM task	Description	Does it involve mental state understanding?	Does it require the participants to differentiate between one and other's mental state?
Blair et al. (1996)	Story interpretation	Mental state interferences from stories	Yes	Yes
Richell et al. (2003)	RMET	Mental state attribution from face pictures	No	No
Dolan and Fullam (2004)	Faux pas	Detection of faux pas	Yes	Yes
	RMET	Mental state attribution from face pictures	No	No
Ali and Chamorro-Premuzic (2010)	RMET	Mental state attribution from face pictures	No	No
	RMVT	Emotion recognition from voices	No	No
Jones et al. (2010)	First- and second-order ToM	Level 2 representation of another's visual experience	Yes	Yes
	Animation task	Mental state attribution from animated shapes	No	No
Shamay-Tsoory et al. (2010)	Yoni	Mental state attribution from eye gaze	No	No
Sommer et al. (2010)	Cartoon stories	Mental state attribution from previous rational action	Yes	No
Schwenck et al. (2012)	Animation task	Mental state attribution from animated shapes	No	No
	Video sequences task	Mental state ascription from movie scenes of social interaction	Yes	Yes
Sebastian et al. (2012)	Cartoon tasks	Motor intention ascription from previous rational action	Yes	No
Brook and Kosson (2013)	Cognitive empathy task	Emotion ascription from previous stories	No	No
Domes et al. (2013)	RMET	Mental state attribution from face pictures	No	No
	MET	Emotion attribution from pictures	No	No
Lockwood et al. (2013)	Animation task	Mental state attribution from animated shapes	No	No
Stellwagen and Kerig (2013a)	ATTM	Mental state interferences from stories	Yes	Yes
Stellwagen and Kerig (2013b)	ATTM	Mental state interferences from stories	Yes	Yes
van Zwieten et al. (2013)	RMET	Mental state attribution from face pictures	No	No
Mier et al. (2014)	Affective ToM tasks	Motor intention ascription from face pictures	No	No
Sandvik et al. (2014)	RMET	Mental state attribution from face pictures	No	No
Sharp and Vanwoerden (2014)	MASC	Mental state ascription from ecological move scenes of social interactions	Yes	Yes
	CET	Mental state attribution from face pictures	No	No
Abu-Akel et al. (2015)	MAS-A	A conversational paradigm	No	No
Nentjes et al. (2015)	RMET	Mental state attribution from face pictures	No	No
Nentjes et al. (2015)	ATTM	Mental state interferences from stories	Yes	Yes
Vonk et al. (2015)	RMET	Mental state attribution from face pictures	No	No
	STEM	Motor intention ascription from previous rational action	Yes	No
	STEU	Mental state attribution from stories	Yes	Yes
	Hinting	Representation of other's thoughts	Yes	Yes
	The imposing memory test	Mental state interferences from stories	Yes	Yes
Centifanti et al. (2016)	Cognitive ToM tasks	Explicit false belief attribution	Yes	Yes
de la Osa et al. (2016)	Yoni	Mental state attribution from eye gaze	No	No
Lui et al. (2016)	Affective perspective taking task	Mental state interferences from stories	Yes	Yes
Song et al. (2016)	False belief prediction and explanation tasks – revised	False belief attribution	Yes	Yes
Oliver et al. (2016)	MET	Emotion attribution from pictures	No	No
Schiffer et al. (2017)	RMET	Mental state attribution from face pictures	No	No
Gillespie et al. (2017)	MASC	Mental state ascription from ecological move scenes of social interactions	Yes	Yes
Kahn et al. (2017)	Cognitive ToM	Mental state interferences from stories	Yes	Yes
	Affective ToM	Mental state attribution from stories	Yes	Yes
Drayton et al. (2018)	Faux pas	Detection of faux pas	Yes	Yes
Foell et al. (2018)	MET	Emotion attribution from pictures	No	No

(*continued on next page*)

Table 4 (*continued*)

Study	ToM task	Description	Does it involve mental state understanding?	Does it require the participants to differentiate between one and other's mental state?
Pajevic et al. (2018)	RMET	Mental state attribution from face pictures	No	No
Schimmenti et al. (2019)	RMET	Mental state attribution from face pictures	No	No
Gillespie et al. (2020)	RMET	Mental state attribution from face pictures	No	No
Kajonius and Bjorkman (2020)	MET	Emotion attribution from pictures	No	No
Roberts et al. (2020)	MASC	Mental state ascription from ecological move scenes of social interactions	Yes	Yes
Carroll et al. (2021)	RMET	Mental state attribution from face pictures	No	No
Remmel et al. (2022)	Faux pas	Detection of faux pas	Yes	Yes
Flórez et al. (2022)	RMET	Mental state attribution from face pictures	No	No
van Dongen et al. (2022)	Faux pas	Detection of faux pas	Yes	Yes
Weinstein et al. (2022)	Dot task	Level 1 representation of another's visual experience	No	No
	MASC	Mental state ascription from ecological move scenes of social interactions	Yes	Yes

Note. ATTM = Advanced Test of Theory of Mind. CET = Child's Eye Test. MAS-A = Metacognition Assessment Scale-Abbreviated Version. MASC = Movie Assessment of Social Cognition. MET = Multifaceted Empathy Test. RMET = Reading the Mind in the Eyes Test. RMVT = Reading the Mind in the Voice Test. STEM = Situational Test of Emotion Management. STEU = Situational Test of Emotion Understanding.

registration, duplication of data extraction, and quality assessment of all selected studies, it is nonetheless subject to some limitations. One limitation is that differences in the difficulty and psychometric properties of ToM outcome measures can vary (Navarro, 2022; Quesque and Rossetti, 2020). In addition, our statistical power analysis suggests that approximately 388 participants are needed for 80% power and 536 participants are needed for 90% power. Based on this estimate, many of the studies are underpowered, which may increase the likelihood of false positives (Case and Ambrosius, 2007). We were also unable to perform moderator analyses looking at the association of ToM with distinct psychopathic traits based on three-factor models of psychopathy due to limitations in available data. We suggest that future studies should report all facet and factor level analyses separately, to provide a more nuanced understanding of distinct psychopathic traits. We also included a limited number of longitudinal studies, which are helpful for understanding the associations of psychopathic traits with ToM through different stages of development in the same sample. Longitudinal studies will also be useful for understanding the implications of psychopathy-related impairments in ToM task performance for future positive and negative outcomes, including relationships with peers, social functioning, academic progress, attitude to learning, externalizing behaviors, and aggression.

In conclusion, our results show that ToM abilities are impaired in people with psychopathic traits, and that this effect is independent of age group, sample type, psychopathy measurement format, psychopathy measurement structure, cognitive versus affective ToM, inclusion of RMET, and the use of a more stringent definition of ToM. We did however find that interpersonal/affective traits were associated with a more pronounced impairment in ToM task performance compared to lifestyle/antisocial traits. Notably, the modest effect sizes we observed suggest that ToM is not a core deficit among psychopathic individuals as might be argued for schizophrenia or autism (Andreou and Skrimpa, 2020; Bora et al., 2009; Chung et al., 2014). There is a need for further studies to investigate the effects of distinct psychopathy facets using different conceptualizations of psychopathy and measurement structures, and high quality, robust longitudinal studies to examine the impact on later life outcomes. Follow-up studies can also increase our understanding of the nature of psychopathy. This is a necessary next step for a more accurate assessment of ToM abilities and its ramifications for interventions in psychopathy.

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Declaration of interest

None.

Data Availability

I have shared the link to my data and code in the manuscript under the statistical analysis section.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at 10.1016/j.neubiorev.2023.105231.

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