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REVIEW

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# Meta-analysis of associations between empathy and alcohol use and problems in clinical and non-clinical samples

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## Abstract

**Aims:** To (1) measure the aggregated effect size of empathy deficits in individuals with alcohol use disorder (AUD) compared with healthy controls, (2) measure the aggregated effect sizes for associations between lower empathy and heavier alcohol consumption and more alcohol problems in non-clinical samples and (3) identify potential moderators on the variability of effect sizes across studies in these meta-analyses.

**Method:** PsycINFO, PubMed and Google Scholar were searched following a pre-registered International Prospective Register of Systematic Reviews (PROSPERO) protocol (CRD42021225392) and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. We meta-analyzed (using random-effects models) mean differences in empathy between individuals with AUD compared with healthy controls and associations between empathy and alcohol consumption and alcohol problems in non-clinical samples. A total of 714 participants were included in the meta-analysis on clinical samples; 3955 were included in the meta-analyses on non-clinical samples.

**Results:** Individuals with AUD reported significantly lower empathy than healthy controls [Hedges' $g$ = −0.53, 95% confidence interval (CI) = −0.91, −0.16, $k$ = 9, $P$ < 0.01, $Q$ = 40.09, $I^2$ = 80.04]. Study quality [Q = 1.88, degrees of freedom (d.f.) = 1, $P$ = 0.17] and gender ($\beta$ = −0.006, $Z$ = −0.60, $P$ = 0.55) were not moderators. Increases in age corresponded to an increase in effect size ($\beta$ = 0.095, $Z$ = 3.34, $P$ < 0.001). Individuals with AUD (versus healthy controls) had significantly lower cognitive (Hedges' $g$ = −0.44, CI = −0.79, −0.10, $P$ < 0.05), but not affective empathy (Hedges' $g$ = −0.19, CI = −0.51, 0.14, $P$ = 0.27), and the difference between these was significant ($Z$ = 2.34, $k$ = 6, $P$ < 0.01). In non-clinical samples, individuals with lower (versus higher) empathy reported heavier alcohol consumption ($r$ = −0.12, CI = −0.15, −0.09, $k$ = 11, $P$ < 0.001, $Q$ = 9.68, $I^2$ = 0.00) and more alcohol problems ($r$ = −0.08, CI = −0.14, −0.01, $k$ = 7, $P$ = 0.021, $Q$ = 6.55, $I^2$ = 8.34). There was no significant heterogeneity across studies.

**Conclusion:** Individuals with alcohol use disorder appear to show deficits in empathy compared with healthy controls. Deficits are particularly pronounced for older individuals and for cognitive (versus affective) empathy. In non-clinical samples, lower empathy appears to be associated with heavier alcohol consumption and more alcohol problems.

KEYWORDS
Alcohol, alcohol problems, alcohol use disorder, empathy, heavy drinking, theory of mind

## INTRODUCTION

Alcohol use disorder (AUD) is one of the most prevalent mental disorders, affecting nearly 15% of the United States population and 8.6% of men and 1.7% of women globally [1, 2]. AUD is linked to significant global disability, distress, morbidity and mortality [2, 3]. Social impairments are a central feature of AUD [4], but the social and cognitive mechanisms that contribute to these problems are poorly understood [5]. A better understanding of socio-cognitive deficits involved in AUD is needed to elucidate mechanisms underlying social impairments linked to problematic alcohol use and to develop more effective AUD interventions.

Much prior research on socio-cognitive deficits in AUD has focused on theory of mind (ToM), a subdomain of social cognition typically defined as the ability to recognize and attribute mental states to oneself and others [6]. Compared to healthy controls, individuals with AUD show impairments in ToM with medium to large effect sizes (see [7, 8] for meta-analyses). A related socio-cognitive ability that is often compromised in individuals with AUD is the ability to empathize with others. Empathy, which is vital to forming and maintaining social relationships [9–11], is typically divided into cognitive empathy, defined as the capacity to understand another's emotional perspective or mental state, and affective empathy, defined as the capacity to share another's emotional state [12, 13]. Although cognitive empathy appears similar to ToM, these constructs are viewed as being distinct, with the former related to the ability to understand another's emotional state and the latter related to the ability to recognize another's mental state [14]. A recent narrative review on empathy and substance use found that compared to healthy controls, adults with AUD often demonstrated impairments in various facets of empathy (e.g. empathic concern, perspective-taking) [5], as assessed by self-report questionnaires and behavioral tasks [15–17]. The findings were mixed, however, as two studies found no empathy deficits in individuals with AUD compared to healthy controls [18, 19]. Further, a systematic review was not conducted, and only a subset of published studies comparing empathy in individuals with AUD versus healthy controls was considered (see [5]). Thus, while deficits in empathy appear to be linked to AUD, no prior studies have meta-analyzed results across all available studies. The current study is the first, to our knowledge, to do so, providing a critical evaluation of the strength and reliability of these effects across studies. We further test whether individuals with AUD have particular deficits in affective versus cognitive empathy, as prior findings are also inconsistent here (e.g. [20, 21]). These findings will lead to improved understanding of the socio-cognitive mechanisms that may underlie social impairments found in AUD.

Deficits in empathy (and other socio-cognitive variables) in individuals with AUD are often interpreted as being a result of long-term alcohol misuse (e.g. [5]). Chronic heavy alcohol consumption is associated with severe and multiple neurocognitive problems (e.g. memory and executive functioning deficits), including abnormalities in prefrontal and limbic brain regions important for cognitive and emotional processing, which may lead to socio-cognitive impairments that persist even when individuals are sober [22–26]. It remains unclear, however, whether potential links between empathy deficits and AUD extend to non-clinical samples, where individuals may not have the same chronic history of alcohol misuse as those with AUD. In fact, empathy deficits may be an early AUD risk factor, predisposing individuals to heavy alcohol use and the development of alcohol problems [5, 27]. Consistent with this, a recent systematic review conducted on adolescents found an association between lower empathy and substance use in the five studies reviewed [27]. However, only three of the included studies specifically looked at alcohol use, young adults and adults were not considered and a meta-analysis was not conducted. While studies in adolescents and other non-clinical samples (e.g. college students, community adults) often find links between deficits in empathy and problematic alcohol use (e.g. binge drinking [28–30]), null findings have also been reported [31, 32]. Thus, the second aim of the current paper is to quantitatively synthesize results across studies examining the associations between empathy and alcohol consumption and alcohol problems in adolescent, college and adult/community samples (referred to herein as non-clinical samples). Findings from this meta-analysis will inform whether potential links between empathy deficits and AUD extend to non-clinical samples, which would be consistent with the proposition that deficits in empathy may also act as a risk factor for the development of alcohol problems [5].

The current study is the first to provide quantitative analyses of associations between deficits in empathy and alcohol use and problems in clinical and non-clinical samples. We present three meta-analyses—one examining whether individuals with AUD show deficits in empathy compared to healthy controls, and two examining associations between empathy and alcohol consumption and alcohol problems in non-clinical samples. Relevant moderating variables were explored when possible, such as study quality, empathy subscale (i.e. cognitive and affective empathy), empathy measure, age and gender. We hypothesized that (1) individuals with AUD would demonstrate deficits in empathy compared to healthy controls and (2) lower empathy would be associated with heavier alcohol consumption and more alcohol problems in non-clinical samples. We made no predictions regarding links between alcohol use/misuse and cognitive versus affective empathy, given largely conflicting findings in past studies (e.g. [20, 21]).

## METHODS

We report methodology in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines

**TABLE 1** Meta-analysis of studies comparing empathy levels of individuals with alcohol use disorder to healthy controls (HC)

| Study authors | AUD | HC | Hedges' *g* | 95% CI | *Z* | *P* |
|---|---|---|---|---|---|---|
| Amenta et al., 2013 [33] | 22 | 22 | −0.54 | −1.13, 0.06 | −1.78 | 0.08 |
| Erol et al., 2017[b] [15] | 33 | 33 | −0.57 | −1.06, −0.08 | −2.30 | < 0.05 |
| Gizewski et al., 2013 [34] | 12 | 12 | −0.15 | −0.94, 0.64 | −0.36 | 0.72 |
| Grynberg et al., 2017 [21] | 41 | 37 | −0.23 | −0.68, 0.22 | −1.02 | 0.31 |
| Martinotti et al., 2009 [16] | 107 | 107 | −0.65 | −0.93, −0.38 | −4.68 | < 0.001 |
| Maurage et al., 2011 [20] | 30 | 30 | −0.21 | −0.72, 0.29 | −0.82 | 0.41 |
| Mohagheghi et al., 2015 [17] | 40 | 40 | −2.06 | −2.60, −1.52 | −7.49 | < 0.001 |
| Schmidt et al., 2016[a] [18] | 31 | 30 | −0.33 | −0.91, 0.25 | −1.11 | 0.27 |
| Schmidt et al., 2017[a] [35] | 13 | 34 | | | | |
| Thoma et al., 2013 [19] | 20 | 20 | 0.09 | −0.52, 0.70 | 0.29 | 0.77 |
| Overall estimate | | | −0.53 | −0.90, −0.16 | −2.78 | < 0.01 |
| | Heterogeneity | | $Q$ = 40.09 | $P$ < 0.001 | $I^2$ = 80.04 | $\tau^2$ = 0.25 |

[a]These studies used the same sample; we averaged over the statistics;
[b]only empathy scores collected immediately after detoxification were included to match similar assessment time-points in the other included studies.
AUD = alcohol use disorder.

[36] (see Table 1) and following a pre-registered International Prospective Register of Systematic Reviews (PROSPERO) protocol (http://www.crd.york.ac.uk/PROSPERO/, registration number CRD42021225392). Literature searches were conducted in December 2020 and August 2021, using the databases Pubmed, PsycINFO and Google Scholar to identify relevant studies published since January 1970, with search terms including [empathy] and [alcohol]. Searches were limited for two of the databases, such that keywords had to appear in the title for Google Scholar searches and in the title or abstract for PsycInfo searches. The reference lists of identified studies were also scanned, and reverse searches were generated and scanned for appropriate studies. To be included in the meta-analyses, studies had to either provide data on empathy in AUD samples compared to healthy controls or provide data on the associations between empathy and alcohol use or problems in non-clinical samples. Inclusion was not limited by study location (i.e. country in which the study took place). Exclusionary criteria included non-human animal, non-English language and non-peer-reviewed/unpublished studies.

## Data extraction, coding and statistical analysis

We extracted mean values for empathy measures in AUD samples and healthy controls and correlations for the associations between empathy measures and the following superordinate factors in non-clinical samples: 'alcohol consumption' and 'alcohol problems' (see Supporting information, Table S1 for a list of variables included in each factor). When these statistics were not available, we requested them from authors. A second member of the study team independently verified the extracted data for accuracy, and the few discrepancies were reconciled by team discussion. Analyses were run using Comprehensive Meta-Analysis (CMA) version 2.0 software [37]. Final effect sizes were reported as Hedges' *g* for studies comparing AUD samples to healthy controls and Pearson's *r* for correlational studies on non-clinical samples. Hedges' *g* of 0.2, 0.5 and 0.8 indicate small, medium and large effect sizes, respectively [38]. Pearson's *r* of approximately 0.1, 0.3 and 0.5 indicate small, medium and large effect sizes, respectively [39]. The significance threshold for all analyses was set at $P < 0.05$.

Each value contributing to an aggregate effect size was independent of all other values [37, 40]. For studies that included a measure of empathy with multiple subcomponents (e.g. [41]) and for the one study that reported more than one measure of empathy (i.e. [20]), a single effect size was calculated by averaging multiple effect sizes of empathy within each study. When studies reported associations between empathy and multiple alcohol variables categorized within the same superordinate factor (e.g. the alcohol consumption superordinate factor included both quantity and frequency of drinking episodes), an average effect size was computed across the variables. Similarly, we computed an average effect size across studies that used the same participant sample. This ensured that studies with shared samples contributed only one weighted effect size.

Random-effects models were used for all analyses [42]. The heterogeneity of effect sizes across studies in each meta-analysis was tested with the $I^2$- and *Q*-statistics [37]. When the heterogeneity test was significant, we examined potential moderation by study quality, empathy subscale (i.e. cognitive versus affective empathy), empathy measure, age and gender. To test for moderation by study quality, studies were assessed based on a modified version of the adapted quality assessment tool for quantitative studies (QATQS) that included relevant items [43] (see Supporting information, Scale S1). To test for significant differences in effect sizes between empathy subscales (i.e. cognitive versus affective empathy) in studies that included both, we created superordinate factors for 'cognitive empathy' and 'affective empathy' (see Supporting information, Table S2), and compared multiple outcomes within each study (see [44]). To test for moderation by empathy measure, we compared the two most commonly used

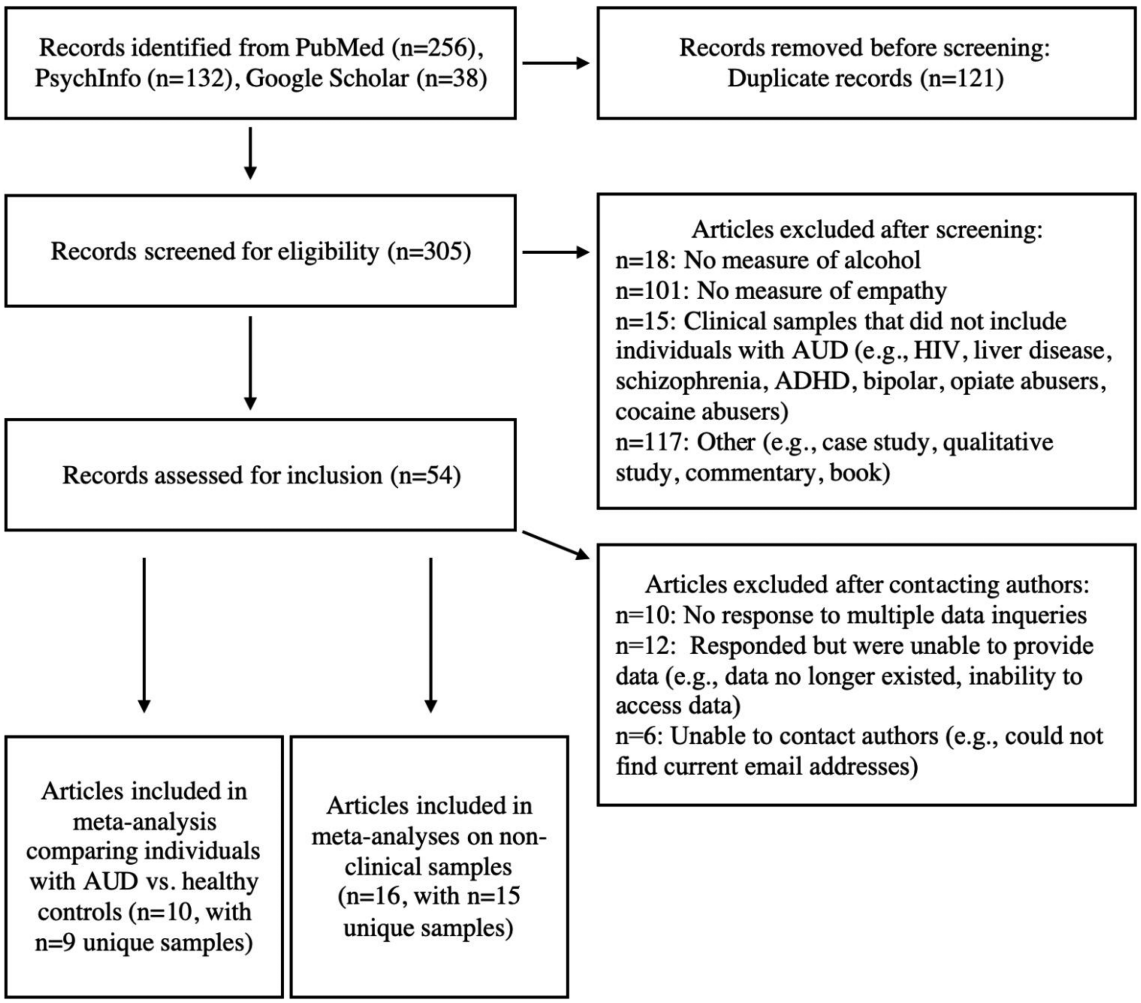


**FIGURE 1** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram for studies selected for the meta-analysis

empathy measures [i.e. the empathy quotient (EQ) [45] and the interpersonal reactivity index (IRI) [46, 47]] to each other and to all other measures. To test for moderation by age, a meta-regression was run using mean age in each study as a continuous moderator. To test for moderation by gender, a meta-regression was run using the percentage of females in each study as a continuous moderator variable.

Publication bias was evaluated with methods commonly used in the literature (i.e. Begg's rank correlation test [48], visual inspection of funnel plots and trim-and-fill methods [49]). Publication bias was determined based on whether (1) Begg's rank correlation tests were significant, (2) there was considerable asymmetry in the funnel plots and (3) trim-and-fill models were considerably different from the tested models [49, 50].

## RESULTS

A total of 550 studies were identified in the search (see Figure 1). Twenty-six articles, including 24 unique samples and 4672 individuals, were included in the meta-analyses. Specifically, 10 articles (nine unique samples; $n$ = 714) were included in the meta-analysis comparing AUD samples ($n$ = 349) to healthy controls ($n$ = 365). Sixteen articles (15 unique samples; $n$ = 3955) were included in the meta-analyses on non-clinical samples; 11 unique samples examined alcohol consumption outcomes ($n$ = 3376) and seven unique samples ($n$ = 1056) examined alcohol problems. The average study quality rating was slightly higher for studies in the meta-analysis comparing AUD samples to healthy controls [mean = 2.20, standard deviation (SD) = 0.42] than for studies in the meta-analyses on non-clinical samples (mean = 1.63, SD = 0.50) (see Supporting information, Table S3). Based on the rating scale used, these average study quality scores indicate moderate quality. Moderate quality studies typically included information on participation selection (e.g. representativeness, the percentage that agreed to participate), appropriately adjusted for some or most confounders (e.g. age, gender, education), reported information on dropout rates and clearly stated their hypothesis and inclusion/exclusion criteria (see Supporting information, Scale S1). Below, we first present the results of the meta-analysis comparing individuals with AUD to healthy controls; we then present the results of the meta-analyses on non-clinical samples.

**TABLE 2** Moderation analyses comparing individuals with alcohol use disorder to healthy controls

| Moderator | | *n* | Point estimate | 95% CI | Statistic | *P* |
|---|---|---|---|---|---|---|
| Study quality | Moderate | 7 | Hedges' $g$ = −0.57 | −1.05, −0.10 | | |
| | Strong | 2 | Hedges' $g$ = −0.34 | −0.70, 0.01 | $Q$ = 1.88 | 0.17 |
| Empathy subscale: cognitive versus affective | Cognitive | 6[a] | Hedges' $g$ = −0.44 | −0.79, −0.10 | | |
| | Affective | | Hedges' $g$ = −0.19 | −0.51, 0.14 | $Z$ = 2.34 | < 0.01 |
| Empathy measure: EQ versus IRI | EQ | 3 | Hedges' $g$ = −0.62 | −0.84, −0.40 | | |
| | IRI | 3 | Hedges' $g$ = −0.13 | −0.51, 0.24 | $Q$ = 4.88 | 0.027 |
| Empathy measure: EQ versus all others | EQ | 4 | Hedges' $g$ = −0.56 | −0.76, −0.35 | | |
| | All others | 5 | Hedges' $g$ = −0.55 | −1.34, 0.25 | $Q$ = 0.04 | 0.85 |
| Empathy measure: IRI versus all others | IRI | 4 | Hedges' $g$ = −0.16 | −0.46, 0.14 | | |
| | All others | 5 | Hedges' $g$ = −0.80 | −1.34, −0.26 | $Q$ = 9.98 | < 0.01 |
| Age | | 9 | ß = 0.09 | 0.04, 0.15 | $Q$ = 11.15 | < 0.001 |
| Gender percentage | | 9 | ß = −0.006 | −0.02, 0.01 | $Q$ = 0.36 | 0.55 |

EQ = empathy quotient; IRI = interpersonal reactivity index; CI = confidence interval.
[a]This analysis examined coginitive versus affective empathy within studies rather than across studies, thus only studies that included both cognitive and affective were included in this moderation analysis.

## AUD versus healthy controls meta-analysis

Results for the meta-analysis examining differences in empathy in AUD samples compared to healthy controls are shown in Table 1. All nine studies matched the AUD groups and the healthy control groups on age and gender, and eight studies additionally matched these two groups on intelligence (i.e. education level or IQ). As predicted, individuals with AUD reported significantly lower empathy than healthy controls (Hedges' $g$ = −0.53, CI = −0.91, −0.16, $P$ < 0.01), indicative of a medium effect size. Results from the moderation analyses are presented in Table 2. There was significant heterogeneity across studies, but this heterogeneity was not explained by study quality [$Q$ = 1.88, degrees of freedom (d.f.) = 1, $P$ = 0.17] or gender ($\beta$ = −0.006, CI = −0.02, 0.01, $Z$ = −0.60, $P$ = 0.55). There was significant moderation by age, such that increases in age corresponded to an increase in effect size ($\beta$ = 0.09, CI = 0.04, 0.15, $Z$ = 3.34, $P$ < 0.001).

Six studies reported data separately for cognitive and affective empathy (see Table 2). Compared to healthy controls, individuals with AUD had significantly lower cognitive empathy (Hedges' $g$ = −0.44, CI = −0.79, −0.10, $P$ < 0.05), but not affective empathy (Hedges' $g$ = −0.19, CI = −0.51, 0.14, $P$ = 0.27), and the difference between these Hedges' $g$ statistics was significant ($Z$ = 2.34, $P$ < 0.01). There was also significant heterogeneity across empathy measures ($Q$ = 38.96, d.f. = 4, $P$ < 0.001). Three studies used the EQ [15, 16, 33] as the measure of empathy, and three studies (across four articles) used the IRI [18, 19, 34, 35] (see Tables 2 and 3). One study used both the EQ and the IRI [20]. [Note: this study was excluded when comparing studies that used the EQ versus studies that used the IRI.] The remaining studies used some other measure of empathy (e.g. the multi-faceted empathy test score—see Table 3).

We first compared the EQ to the IRI. Individuals with AUD scored significantly lower in studies that administered the EQ ($k$ = 3, Hedges' $g$ = −0.62, CI = −0.84, −0.40, $P$ < 0.001), but did not differ from healthy controls in studies that used the IRI ($k$ = 3, Hedges' $g$ = −0.13, CI = −0.51, 0.24, $P$ = 0.48). The difference between these Hedges' $g$ statistics was significant ($Q$ = 4.88, d.f. = 1, $P$ = 0.027). We then compared the EQ to all other measures. Individuals with AUD scored significantly lower on empathy when using the EQ ($k$ = 4, Hedges' $g$ = −0.56, CI = −0.76, −0.35, $P$ < 0.001), but did not differ from healthy controls when using other measures ($k$ = 5, Hedges' $g$ = −0.55, CI = −1.34, 0.25, $P$ = 0.17). However, the difference between these Hedges' $g$ statistics was not significant ($Q$ = 0.04, d.f. = 1, $P$ = 0.85). Finally, we compared the IRI to all other measures. Individuals with AUD did not differ from healthy controls on empathy when using the IRI ($k$ = 4, Hedges' $g$ = −0.16, CI = −0.46, 0.14, $P$ = 0.30), but scored significantly lower when using other measures ($k$ = 5, Hedges' $g$ = −0.80, CI = −1.34, −0.26, $P$ < 0.01). The difference between these Hedges' $g$ statistics was significant ($Q$ = 9.98, d.f. = 1, $P$ < 0.01).

## Non-clinical samples meta-analyses

Results for the meta-analyses examining associations between empathy and alcohol consumption and alcohol problems in non-clinical samples are shown in Table 4. As predicted, lower empathy was associated with heavier alcohol consumption ($r$ = −0.12, CI = −0.15, −0.09, $P$ < 0.001) and more alcohol problems ($r$ = −0.08, CI = −0.14, −0.01, $P$ = 0.021), indicative of small effect sizes. There was not significant heterogeneity across studies for either alcohol consumption ($Q$ = 9.68, d.f. = 10, $P$ = 0.47) or alcohol problems ($Q$ = 6.55, d.f. = 6, $P$ = 0.37), and thus moderation analyses were not conducted (see [44]).

**TABLE 3** Characteristics of studies included in the clinical and non-clinical meta-analyses

| Study | Population | Design | Measure of empathy |
|---|---|---|---|
| Abbey et al. 2006[a] [31] | US population: male community sample (*n* = 163) | Cross-sectional | DES: assessed and combined perspective-taking and empathic concern subscales |
| Amenta et al. 2013[b] [33] | Belgian population: male clinical AUD sample (*n* = 22) versus male healthy controls (*n* = 22) | Cross-sectional | EQ: assessed cognitive empathy, social skills and emotional reactivity |
| Charpentier et al. 2016[a] [51] | US population: convenience sample of community members who previously participated in neuroimaging studies of alcoholism risk (*n* = 176) | Cross-sectional | EIVES: included 19-item subscale assessing empathy |
| Erol et al. 2017[b] [15] | Turkish population: clinical AUD sample (*n* = 33) versus healthy controls (*n* = 33) | Cross-sectional[c] | EQ: assessed overall empathy |
| Fielding et al. 2018[a] [52] | New Zealand population: student sample (*n* = 120) | Cross-sectional | IRI: only assessed empathic concern |
| Gizewski et al. 2013[b] [34] | German population: clinical schizophrenia sample (*n* = 24) versus clinical AUD sample (*n* = 12) versus healthy controls (*n* = 12) | Cross-sectional[d] | IRI: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Grynberg et al. 2017[b] [21] | Belgian and French population: clinical AUD sample (*n* = 41) versus healthy controls (*n* = 37) | Cross-sectional | MET-Core: assessed decoding and sharing of emotions |
| Kessler et al. 2018[a] [53] | German population: medical professional sample (*n* = 198) | Cross-sectional | Empathizing scale short form: assessed the extent of the ability to be empathic |
| Kroll et al. 2018[a] [54] | Swiss population: polysubstance users (*n* = 47) and controls (*n* = 59) | Cross-sectional | MET: assessed cognitive and emotional empathy |
| Laghi et al. 2019[a] [28] | Italian population: student sample (*n* = 188) | Cross-sectional | IRI : assessed perspective-taking and empathic concern |
| Lannoy et al. 2020[a] [29] | French population: student sample (*n* = 202) | Cross-sectional | BES: assessed cognitive and affective empathy in youths |
| Low & Espelage 2013[a] [55] | US population: student sample (*n* = 1023) | Cross-sectional[c] | Teen conflict survey–empathy: assessed adolescents ability to listen, care and trust others |
| Lyvers et al. 2017[a] [41] | Australian population: university sample (*n* = 102) | Cross-sectional | IRI: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Lyvers et al. 2018[a] [30] | Australian population: community sample (*n* = 161) | Cross-sectional | IRI: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Lyvers & Meester 2012[a] [56] | US population: online sample (*n* = 337) | Cross-sectional | BEES: assessed participants perceived ability to identify and feel the emotions of others |
| Martinotti et al. 2009[b] [16] | Italian population: clinical AUD sample (*n* = 107) versus healthy controls (*n* = 107) | Cross-sectional | EQ: assessed overall empathy |
| Maurage et al. 2011[b] [20] | Belgian population: clinical AUD sample (*n* = 30) versus healthy controls (*n* = 30) | Cross-sectional | EQ: assessed cognitive empathy, social skills and emotional reactivity; IRI: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Mohagheghi et al. 2015[b] [17] | Iranian population: clinical AUD sample (*n* = 40) versus healthy controls (*n* = 40) | Cross-sectional | Bar-On EIQ: included empathy subscale |

(Continues)

**TABLE 3** (Continued)

| Study | Population | Design | Measure of empathy |
|---|---|---|---|
| Muntaner et al. 1990[a] [32] | US population: male community sample ($n$ = 85)[e] | Cross-sectional | EIVES included 19-item subscale assessing empathy |
| Nagoshi et al. 1992[a] [60] | US population: male community sample ($n$ = 173)[e] | Cross-sectional | EIVES: included 19-item subscale assessing empathy reflecting sensitivity to the feelings and reactions of others and susceptibility to social cues |
| Nagoshi et al. 1994[a] [57] | US population: university sample ($n$ = 151)[e] | Cross-sectional | EIVES: included 19-item subscale assessing empathy |
| Schmidt et al. 2016[b] [18] | German population: clinical AUD sample ($n$ = 31) versus healthy controls ($n$ = 30) | Cross-sectional | IRI abbreviated version: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Schmidt et al. 2017[b] [35] | German population: clinical AUD sample ($n$ = 13) versus healthy controls ($n$ = 34) | Cross-sectional | IRI abbreviated version: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Thoma et al. 2013[b] [19] | German population: clinical AUD sample ($n$ = 20) versus healthy controls ($n$ = 20) | Cross-sectional | IRI abbreviated version: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Verschuere et al. 2012[a] [58] | Dutch population: adolescent juvenile center sample ($n$ = 57)[e] | Cross-sectional | IRI: assessed perspective-taking, empathic concern, fantasy and personal distress |
| Ybarra et al. 2017[a] [59] | US population: adolescent sample ($n$ = 1058)[e] | Cross-sectional[c] | DES: assessed overall empathy |

DES = Davis empathy scale; EQ = empathy quotient scale; EIVES = Eysenck impulsivity–venturesomeness–empathy scale; IRI = interpersonal reactivity index; MET = multi-faceted empathy test; BES = basic empathy scale; BEES = balanced emotional empathy scale; Bar-On EIQ = Bar-On emotional intelligence questionnaire; AUD= alcohol use disorder.

[a]Studies included in meta-analyses on non-clinical samples.

[b]Studies included in meta-analysis comparing individuals with alcohol use disorder to healthy controls.

[c]These studies used longitudinal designs, but the data used in the meta-analysis were collected at one time-point and thus are cross-sectional.

[d]This study used an experimental design, but the data used in the meta-analysis were collected at one time-point (and taken from variables that were not manipulated), and thus the data are cross-sectional.

[e]Sample sizes reflect total sample sizes. A subset of these total sample sizes was used in analyses (see Table 4 for number of pariticpants included in each studys analysis).

**TABLE 4** Meta-analyses of articles assessing the associations between empathy and alcohol use and problems in non-clinical samples

| Superordinate factor | Article authors | *n* | *r* | 95% CI | *P* |
|---|---|---|---|---|---|
| Alcohol consumption | | | | | |
| | Charpentier et al., 2016 [51] | 176 | −0.15 | −0.29, −0.00 | < 0.05 |
| | Fielding et al., 2018 [52] | 120 | −0.23 | −0.39, −0.05 | < 0.05 |
| | Kessler et al., 2018 [53] | 196 | −0.15 | −0.28, −0.01 | < 0.05 |
| | Kroll et al., 2018 [54] | 106 | 0.01 | −0.18, 0.20 | 0.90 |
| | Laghi et al., 2019 [28] | 188 | −0.11 | −0.25, 0.03 | 0.13 |
| | Lannoy et al., 2020 [29] | 202 | −0.17 | −0.30, −0.03 | < 0.05 |
| | Low & Espelage, 2013 [55] | 1023 | −0.14 | −0.20, −0.08 | < 0.001 |
| | Lyvers & Meester, 2012 [56] | 337 | −0.16 | −0.26, −0.05 | < 0.01 |
| | Nagoshi et al., 1994 [57] | 125 | −0.14 | −0.31, 0.04 | 0.12 |
| | Verschuere et al., 2012 [58] | 27 | −0.29 | −0.60, 0.10 | 0.15 |
| | Ybarra et al., 2017 [59] | 876 | −0.06 | −0.12, 0.01 | 0.11 |
| | Overall estimate | | −0.12 | −0.15, −0.09 | <0.001 |
| | Heterogeneity | $Q$ = 9.68 | $P$ = 0.47 | $I^2$ = 0.00 | $\tau^2$ = 0.00 |
| Alcohol problems | | | | | |
| | Abbey et al., 2006 [31] | 163 | −0.13 | −0.28, 0.02 | 0.10 |
| | Charpentier et al., 2016 [51] | 169 | 0.01 | −0.14, 0.17 | 0.86 |
| | Kroll et al., 2018 [54] | 106 | −0.00 | −0.19, 0.19 | 0.99 |
| | Lannoy et al., 2020 [29] | 202 | −0.18 | −0.31, −0.04 | < 0.05 |
| | Lyvers et al., 2017 [41] | 102 | 0.02 | −0.17, 0.22 | 0.83 |
| | Lyvers et al., 2018 [30] | 161 | −0.14 | −0.29, 0.01 | 0.07 |
| | Muntaner et al., 1990[a] [32] | 69 | −0.02 | −0.24, 0.21 | 0.90 |
| | Nagoshi et al., 1992[a] [60] | 84 | | | |
| | Overall estimate | | −0.08 | −0.14, −0.01 | 0.021 |
| | Heterogeneity | $Q$ = 6.55 | $P$ = 0.37 | $I^2$ = 8.34 | $\tau^2$ = 0.00 |

For articles with multiple variables of interest within the same superordinate factor, these variables were averaged over to generate an overall *r*, 95% confidence interval (CI) and *P*-value.

[a]These articles used the same sample; we averaged over the statistics.

## Publication bias

Begg's rank correlation test [48] resulted in null findings for variables in all meta-analyses (i.e. clinical and non-clinical samples), suggesting no evidence of publication bias. Further, visual inspection of funnel plots suggested there was little evidence of publication bias in any meta-analysis; trim-and-fill imputation of missing studies did not alter effect sizes appreciably (see Supporting information, Figures S1 and S2, Tables S4 and S5).

# DISCUSSION

Social impairments are a central feature of AUD, but the socio-cognitive mechanisms that contribute to these problems remain unclear. The ability to empathize with others is often compromised in individuals with AUD and in those who report problematic alcohol use more generally. Here, we conducted a meta-analysis examining whether individuals with AUD show deficits in empathy compared to healthy controls and meta-analyses examining associations between empathy and alcohol consumption and alcohol problems in non-clinical samples.

## Meta-analytical findings on individuals with AUD versus healthy controls

Meta-analytical results revealed a medium effect size difference, such that individuals with AUD had greater deficits in empathy compared to healthy controls. This aligns with one previous narrative review on a subset of the studies included here that showed that adults with AUD often demonstrated impairments in empathic processing compared to healthy controls [5]. Given reliable associations, future longitudinal and experimental studies are needed to clarify the temporal ordering of these effects (i.e. whether AUD leads to deficits in empathy or vice versa) and to delineate potential clinical implications. If impairments in empathy underlie some of the social and interpersonal dysfunctions found in AUD, this would suggest a target for treatment.

Indeed, empathy is a modifiable socio-cognitive factor [61], and interventions that improve empathy have been shown to reduce a range of problematic behavior, including intimate partner violence [62], bullying [63] and aggression [64]. In fact, a recent study found that an intervention that increased empathy resulted in better alcohol abstinence self-efficacy in individuals with AUD [65]. Therefore, treatments that aim to improve empathic abilities in individuals with AUD may result in better short- and long-term outcomes related to both interpersonal problems and alcohol use. In other words, interventions targeting empathy may potentially be helpful to improve the quality of life of individuals with AUD.

There was significant heterogeneity in effect sizes across studies, which was not explained by study quality or gender. There was significant moderation of the AUD–control effect sizes by the average age of studies; as age increased, the difference in empathy between individuals with AUD versus healthy controls increased. It is noteworthy that age was a moderating factor even though all the studies included in this meta-analysis were conducted on adult populations (i.e. 35–65 years). This suggests a greater risk of social impairments as adults with AUD grow older. However, study-level moderation by age does not necessarily reflect within-study moderation by age (see [66, 67]). Indeed, at the within-study level, two studies found no significant associations between age and empthy in AUD samples [20, 21]. More research is needed to explore age-related impairments in socio-cognitive abilities in individuals with AUD within samples. Future research should also examine empathy levels in adolescents and young adults with AUD compared to age-matched controls to determine if our findings on adults extend to younger populations. While prevalence rates of AUD in adolescents and young adults appear to be declining [68, 69], rates are still high, with approximately 1.3–5.2% of adolescents and 7–8.1% of young adults meeting criteria for AUD [1, 70, 71]. More research is needed on deficits in empathy and AUD in young people.

We found that, in comparison to healthy control groups, individuals with AUD had impairments in cognitive empathy, but not affective empathy. These results suggest that individuals with AUD may be able to share in other people's emotional states, but may have difficulty understanding them. More research is needed to more clearly understand potential differences in cognitive versus affective empathy deficits in AUD, however, as only six studies examined these subcomponents of empathy.

Finally, we examined whether effect sizes differed in studies that used different measures of empathy. The two most commonly used measures of empathy were the EQ and IRI. In general, effects sizes were larger for the EQ than the IRI. This was true when we directly compared effect sizes for the EQ versus the IRI and when comparing the EQ (and, subsequently, the IRI) effect sizes to all other empathy measures. However, due to the small number of studies that used measures other than the EQ or IRI, these latter findings are probably due to including the EQ and the IRI in the 'other measures' category for these analyses. The EQ assesses 'the drive to identify another person's emotions and thoughts, and to respond to these with an appropriate emotion' (e.g. 'I am good at predicting how someone will feel' and 'Seeing people cry does not really upset me') [45]. The IRI captures the multi-dimensionality of empathy by assessing four subscales: perspective-taking, empathic concern, personal distress and fantasy (e.g. 'I try to look at everybody's side of a disagreement before I make a decision' and 'I often have tender, concerned feelings for people less fortunate than me') [46, 47]. Our findings suggest that the EQ is a more sensitive measure for capturing differences in empathy between individuals with AUD and healthy controls. Results should be interepreted with caution, however, given the small number of studies used in these comparisons. Further, it is possible that certain subscales of the IRI (e.g. empathic concern) are more effective than others in capturing differences between individuals with AUD and healthy controls, but we were unable to address this question in the current meta-analysis due to a lack of such data. Future research is recommended to further explore whether some measures of empathy (or some subscales) are more sensitive to detecting empathy differences between individuals with AUD and healthy controls.

## Meta-analytical findings in non-clinical samples

Prior work has tended to focus on differences in socio-cognitive deficits between individuals with AUD and healthy controls, and more research is needed to more clearly understand the role of socio-cognitive deficits in alcohol problems in non-clinical samples (e.g. [28, 29]). Our meta-analytical results in non-clinical samples showed small but reliable associations between lower empathy and heavier alcohol consumption and more alcohol problems. The strengths of these associations did not vary significantly across studies (and thus moderator variables were not tested). These findings indicate that lower empathy is not only seen in individuals with AUD, but is also present in individuals from non-clinical samples who report heavier alcohol use and more alcohol-related problems.

All the studies included in these non-clinical meta-analyses were cross-sectional, but the results are at least consistent with the proposition that deficits in empathy may also precede the onset of heavy alcohol use/problems and serve as a risk factor for problematic alcohol use [27–29]. For instance, young people with socio-cognitive deficits may misperceive and over-value peers' attitudes and norms about drinking and consider drinking a way to be accepted by their peer group, which may lead to alcohol misuse [29, 72]. Alternatively, those who typically struggle with empathic responding while sober may gain particular benefit from alcohol's acute effects in increasing empathy, social bonding and other prosocial variables [73–76]. In fact, in a study of adult social drinkers, a low dose (0.24–0.29 g/kg) of alcohol (versus placebo) increased affective empathy, and this effect was larger for those with lower trait empathy scores [74]. This increased sensitivity to the rewarding social effects of alcohol might place individuals with lower empathy at elevated risk to escalate their drinking and develop alcohol problems. Similar to clinical samples, however, the direction of the associations between empathy deficits and heavier alcohol consumption and more alcohol problems in non-clinical samples remains unknown. Future longitudinal studies are needed to determine whether lower empathy prospectively predicts the emergence of

alcohol problems. The reliable associations we report here will hopefully stimulate more rigorous study designs to clarify the potential causal nature of deficits in empathy in driving problematic alcohol use. It would also be helpful to determine whether related socio-cognitive deficits (e.g. theory of mind deficits) present in individuals with AUD similarly extend to non-clinical samples.

## Limitations, recommendations and conclusions

These meta-analyses have limitations. First, we excluded unpublished studies, which may have inflated the meta-analytical results, given that unpublished studies typically have null findings (although analyses commonly used to assess publication bias did not indicate this). Second, few studies examined differences in cognitive and affective empathic abilities separately, and more research is needed to draw firm conclusions about links between deficits in subcomponents of empathy and alcohol-related outcomes. Third, although a variety of empathy measures was used across studies, due to the limited number of studies using any particular measure, we were unable to run separate meta-analyses for each measure of empathy. Future studies should explore the ability of different measures of empathy to detect differences between individuals with AUD versus healthy controls. Fourth, we examined gender differences in empathic abilities of individuals with AUD compared to healthy controls by accounting for the percentage of females (versus males) in each study. However, future individual-level studies that report separate results for male and female participants and that test gender × AUD versus healthy control condition interactions would allow for more definitive conclusions to be made about potential gender differences in the link between empathy deficits and AUD. Research suggests that males and females differ in their empathic abilities, with females typically reporting higher empathy than males in adolescence (e.g. [77]) and adulthood (e.g. [45, 47]), and in their alcohol consumption, with males typically consuming more alcohol on average than females [78]. Further, in studies examining individuals with AUD compared to healthy controls, females in the control group tend to have higher empathic abilities than males in the control group [16]; however, males and females with AUD do not appear to differ in empathic abilities [16, 17, 21]. Future research should explore gender differences in empathy among individuals with AUD (and alcohol problems more generally) to identify whether females might be particularly likely to show empathy deficits.

In addition, due to a lack of such data, we were unable to examine associations between deficits in empathy and AUD in individuals with comorbid mental health disorders. AUD often co-occurs with conditions that are also associated with deficits in empathic processing (e.g. antisocial and borderline personality disorders [79, 80]), including some with clinically low levels of empathy (e.g. callous–unemotional traits present in conduct disorder) [81]. Future studies are required to examine the association between deficits in empathy and AUD while also accounting for other relevant comorbid mental health disorders.

Finally, and most importantly, more rigorous study designs are needed to clarify associations between empathy deficits and alcohol problems. Longitudinal studies are necessary to determine whether chronic heavy alcohol use seen in AUD leads to deficits in empathy and/or whether deficits in empathy may predispose individuals to develop alcohol problems. Ecololgical momentary assessment studies would be helpful in clarifying the temporal ordering of empathic processes and alcohol use in individuals' daily lives in more naturalistic settings. Experimental research that manipulates empathy levels and measures alcohol consumption, and research that manipulates alcohol consumption and measures changes in empathy levels, are also needed. These experimental studies would provide the most compelling evidence that empathy plays an important role in alcohol use and misuse.

In summary, findings demonstrate that individuals with AUD have lower empathy than healthy controls, and that this is particularly true for older adults and cognitive (versus affective) empathy. Further, lower empathy is associated with heavier alcohol consumption and more alcohol problems in non-clinical samples. Future studies are needed to continue to explore the role of empathy and other socio-cognitive factors in alcohol use and misuse. Such research will elucidate the potential long-term effects of alcohol misuse on socio-cognitive abilities and determine whether socio-cognitive deficits may also predispose individuals to misuse alcohol. Indeed, it is possible that deficits in empathy may predict alcohol problems and that heavy alcohol use may exacerbate these deficits.

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### DECLARATION OF INTERESTS

None.

### AUTHOR CONTRIBUTIONS

**Lakshmi Kumar:** Conceptualization; data curation; formal analysis; methodology. **Carillon J. Skrzynski:** Formal analysis. **Kasey G. Creswell:** Conceptualization; data curation; formal analysis; funding acquisition; methodology; project administration; supervision.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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