Callous-Unemotional Traits among Children and Adolescents in Asian Cultures: A Systematic Review

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Abstract

Considerable evidence now exists for callous and unemotional (CU) traits as markers for a high-risk pathway to child and adolescent conduct problems implicating unique risk processes and treatment needs, but research has been limited largely to Western countries (Frick et al., 2014; Hawes, Price, & Dadds, 2014). We review the evidence base related to CU traits in Asian countries that has emerged in recent years, with respect to four key questions. Specifically, are higher CU traits among Asian children and adolescents associated with (1) increased severity of conduct problems; (2) similar neurodevelopmental and neurocognitive correlates as reported in Western countries; (3) similar environmental risk factors as reported in Western countries; and (4) poorer treatment outcomes? A systematic search identified 28 studies that have reported on child and adolescent CU traits in Asian countries. Consistent with Western samples, CU traits were associated with individual risk factors including atypical neural activation during cognitive tasks and poor empathy, as well as parenting risk factors. CU traits were also positively associated with most measures of conduct problems. Differences from findings in Western samples, however, emerged for areas such as correlates of reactive aggression and delinquent peer influence. Treatment has been investigated in only one study to date and is therefore a high priority for future research. The limitations of existing evidence are addressed along with key directions for future cross-cultural research, including measurement research with children and adolescents.

Keywords: callous-unemotional traits; conduct disorder; psychopathy; Asia

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Callous-unemotional (CU) traits refer to a lack of guilt or remorse, a lack of empathy or concern for others' feelings, a lack of concern about one's performance, and shallow affect (Frick, Ray, Thornton, & Kahn, 2014). These traits have often been conceptualized based on the affective dimension of psychopathy, and were introduced into the fifth edition of the Diagnostic and Statistical Manual of Mental Disorder (DSM-5; American Psychiatric Association, 2013) as a specifier ('limited prosocial emotions') for conduct disorder(CD). The International Classification of Diseases 11th edition (ICD-11) (World Health Organization, 2018) has further applied the specifier to persons meeting criteria for CD) or Oppositional Defiant Disorder (ODD). In recent years, research into the clinical importance of CU traits to child and adolescent mental health has grown rapidly, providing considerable support for CU traits as markers for a distinct, high-risk pathway to conduct problems, associated with unique treatment needs (Frick et al., 2014). Among children with conduct problems, CU traits are associated with more varied, pervasive and severe patterns of violence, delinquency and substance use, beginning in early childhood (Enebrink, Andershed, & Långström, 2005; Frick et al., 2014; Longman, Hawes, & Kohlhoff, 2016; McMahon, Witkiewitz, & Kotler, 2010). Child and adolescent CU traits have also been associated with a range of unique neurocognitive and neurobiological correlates, including abnormalities in the processing of reward and punishment cues (Byrd, Loeber, & Pardini, 2014), deficits in emotion recognition (Dawel et al., 2012), amygdala reactivity to distress in others (de Wied et al., 2012), grey matter volume (Sebastian et al., 2016), and atypical features of various neurochemical systems implicated in empathy (Moul, Hawes, & Dadds, 2018). In terms of distinct environmental risk processes, research has found youths with high CU traits to associate more with antisocial peers (e.g., Kimonis, Frick, & Barry, 2004) than low-CU

youths. A number of studies have also found that risk for conduct problems may be more independent of negative parenting among high-CU children compared to those with low CU traits (e.g., Waller, Gardner, & Hyde, 2013). Additionally, current evidence suggests that high-CU youths are at increased risk for poor treatment outcomes following best-practice interventions for child conduct problems (Hawes et al., 2014).

Research on CU traits has, however, been limited largely to the United Kingdom, United States, Australia, Canada, and Europe (see Frick et al., 2014). It is thus unclear if these findings from Western populations generalize to the Asian cultures, especially as there is little evidence for the generalizability of psychopathy across ethnic groups (Johnstone & Cooke, 2004; Kotler & McMahon, 2005). Past reviews examining psychopathy in relation to outcomes such as criminal recidivism in youth and adults have instead reported some variation in these associations based on country of origin and ethnicity, including a weaker relationship between violent recidivism and psychopathy where there is a higher proportion of non-white juveniles (Edens, Campbell, & Weir, 2007; Guy et al., 2005; Leistico et al., 2008). Further, cross-cultural differences have been reported in other related constructs. For instance, it has been proposed that in East and South East Asia, a tendency toward conformity with social expectations and an emphasis on group harmony over individual desire, may account for the lower levels of conduct problems that have been observed in such populations compared to those from Western countries (Shwalb et al., 2009). In the area of mental illness stigma, there is recent research by Krendl and Pescosolido (2020) that identified cultural differences in the sources of prejudice and attributions about the etiology of mental illness between the East and West. Western culture has also been found to value and promote high arousal emotions, and to experience these emotions more, in contrast to Eastern culture (e.g., Chinese, Japanese) that reportedly values and experiences more low arousal emotions (Lim, 2016). In terms of parenting, ‘strictness’ may be associated with parental hostility and

aggression in the West, but appears to be related to parental concern among Asians (Chao, 1994; Lau & Cheng, 1987). This may explain why authoritarian parenting is associated with negative child outcomes in the West (e.g. Pinquart, 2017), while there have been findings in Asian and non-Caucasian samples indicating positive effects of authoritarian parenting (e.g., Gonzalez, Greenwood, & Hsu, 2001; Leung, Lau, & Lam, 1998). Finally, in one cross-cultural study greater peer influences on adolescent behavior were found among American compared to Chinese adolescents, which may reflect the greater amount of time that American adolescents spend with their peers (Chen et al., 1998).

Interestingly CU traits have been found to occur at higher levels in community-based samples of children in Hong Kong and China compared to the United States (Fung, Gao, & Raine, 2009; Pu et al., 2017). A possible explanation is that the Asian cultural characteristic of restraining emotional expression contributed to this difference (Fung et al., 2009). Allen et al. (unpublished) also reported cultural differences in the strength of item endorsement for items on the Inventory of Callous-Unemotional Traits (ICU) between UK and Chinese school children. The authors further suggested that social norms, such as higher expectations of achievements among Chinese parents, may have contributed to the Chinese students systematically rating some items much higher or lower than the UK respondents, thus resulting in variation in item thresholds. Other researchers have theorized that additional cultural differences between the Eastern and Western cultures (e.g., collectivism versus individualism) may contribute to somewhat different presentations and risk processes in Asian populations with respect to CU traits (Shou et al., 2019). Such differences, however, remain poorly understood.

The aim of this paper was to provide a systematic review of existing research regarding CU traits and their correlates in Asian countries. Specifically, we aimed to determine if evidence about CU traits from Western countries generalizes to Asian countries

in four key areas: (1) severity of conduct problems; (2) neurodevelopmental and neurocognitive risk factors; (3) parenting and peer-related risk factors; and (4) treatment outcomes. We predicted that higher CU traits in Asian countries would be similarly associated with increased severity of conduct problems, neurodevelopmental and neurocognitive correlates and poorer treatment outcomes. However, we predicted variation in the association between CU traits and environmental risk factors due to differences in culture and societal norms such as the emphasis on group harmony and different parenting norms. The psychometric performance of CU traits measures in these populations was also of interest, given the potential for cultural differences in emotional restraint, for example, to impact on the reliability of such measures.

Systematic Search Method

Selection of Studies

A comprehensive literature search was conducted by two of the authors using PsychINFO and MEDLINE to identify studies investigating CU traits in Asian populations dated October 2019 and before[1]. No publication restriction was imposed. Only articles in English were included. Titles and abstracts were screened using the following criteria: (a) samples with an upper age range of 19 years; (b) studies conducted in Asian countries; (c) measurement of CU traits through measures that are established or supported by psychometric investigation; and (d) data reported on associations between CU traits and conduct problems, individual or environmental risk factors, or treatment outcomes.

[1] This was done using the following search combined terms: (adolescen* OR boy* OR child* OR girl* OR infant* OR juvenile* OR preadolescen* OR pre-adolescen* OR preschool* OR pre-school* OR schoolchild* OR toddler* OR teen* OR young OR youth) AND (callous* OR psychopathy OR psychopathic OR psychopath OR sociopath* OR unemotional) AND (Asia* OR chinese OR china OR hong kong* OR Macau* OR taiwan* OR Japan* OR Mongoli* OR Korea* OR Singapore* OR Brunei* OR Cambodia* OR Timor* OR Indonesia* OR Lao* OR Malay* OR Myanmar* OR Burm* OR Philippines OR Filipino* OR Thai* OR Vietnam* OR India* OR Afghan* OR Bangladesh* OR Bhutan* OR Maldiv* OR Nepal* OR Pakistan* OR Sri Lanka* OR Kazakh* OR Kyrgy* OR Tajik* OR Turk* OR Uzbek* OR Armenia* OR Azerbaijan* OR Bahra* OR Iran* OR Iraq* OR Israel* OR Jordan* OR Kuwait* OR Leban* OR Oman* OR Qatar* OR Saud* OR Arab* OR Syria* OR Aramean* OR Assyrian* OR UAE OR Emirat* OR Yemen OR Palestin* OR Georgia* OR Persia* OR East*)

The initial search identified 287 records. 44 duplicate records were first removed, and the titles and abstracts of the remaining studies were screened. Of these, the full texts of 50 studies were examined to assess whether they met the inclusion criteria of this paper. 25 studies were removed, of which one was not from an Asian sample, three exceeded the age limit of 19, 16 measured psychopathy but not CU traits, and five did not study associations that were of interest. 25 studies were thus retained after screening. Three additional unpublished studies were included by seeking the submitted manuscripts from the researchers in this field. There was thus a final pool of 28 studies that comprised 24 different samples.

Study Characteristics

Study characteristics are presented in Table 1. Studies included 24 peer-reviewed research reports published between 2009 and 2019, three unpublished studies, and one dissertation (Law, 2012). In total, the 25 samples comprised N = 27,586 children and adolescents, with sample sizes ranging from 29 to 9,797. This included four very small samples ($N < 100$). Law (2012) also reported results for subgroups, which were extremely small (e.g., $n = 21$). Data from studies with small sample sizes should thus be interpreted with caution. The participants ranged in age from three to 19 but there were only two preschool sample (three to five years). Studies from East Asia (Hong Kong, China, Taiwan, Japan and South Korea) made up more than half of the studies. Other countries that were represented were Israel and Turkey from West Asia, as well as Singapore and Malaysia from South East Asia. The studies were mostly cross-sectional studies, with the exception of five longitudinal studies and three intervention studies based on one sample. None of the studies provided a cross-cultural comparison of findings between Asian and Western samples, in any of the four key areas of interest.

In terms of the measure of CU traits, 23 samples measured CU traits and one sample

measured callousness. The Antisocial Process Screening Device (APSD; Frick & Hare, 2001) was the most commonly used instrument. 12 samples used the APSD, with eight samples using the standard six-item CU subscale, three samples adapting the CU subscale to include only four items, and one sample combining items from APSD with Inventory of Callous-Unemotional Traits (ICU; Frick, 2004). The next most common measure was the ICU only, reported by eight samples.

Results

The psychometric performance of the CU traits measures, together with findings in relation to each of the four core questions of the review, is summarized below. Key findings are also presented in Table 2, along with the studies' main methodological limitations and strengths, as well as effect sizes ("Effect size converter"; Lenhard & Lenhard, 2016).

Psychometric Properties of CU Traits Measures

The identified studies offer emerging psychometric evidence regarding the measurement of CU traits in Asian countries. Notwithstanding the limitations of Cronbach's alpha (α) as an index of reliability (McCrae et al., 2011), it was reported for only ten of the study samples, and four samples did not include any information on reliability. For the two most commonly used instruments (APSD and ICU), the ICU (both the 24-item and 11-item versions) generally showed good internal consistency. A 4-item version of the APSD CU traits scale appeared to outperform the 6-item scale typically used in the Western samples. Li et al (2017) suggested that this may be because 'not showing emotions' is widely accepted in Asian culture, as Asian children are not encouraged to express many feelings. As such, the corresponding item on APSD may not capture callousness and unemotionality as seen in the Asian context. Eremsoy, Karanci & Berument (2011) also found a need to retranslate the

APSD in Turkish to ensure that the words used for 'not showing emotions' accurately conveyed the original meaning. Taken together, the studies highlighted the need for more attention to be given to cultural factors that may affect the interpretation of questions in CU traits measures, especially when translation is involved.

CU Traits and Severity of Child and Adolescent Conduct Problems

Data on associations between CU traits and conduct problems among children and adolescents were available from 15 samples, spanning a broad range of countries. Nine samples reported that CU traits were significantly associated with indices of conduct problems (d = .15 – 1.90), including delinquency (Fung et al., 2009; Li & Ang, 2019) and total aggression (Fung et al., 2009; Raine et al., 2014). This included two longitudinal studies that found that CU traits predicted later antisocial behavior (Hwang et al., unpublished; Yoshida et al., 2019). Six studies, however, reported mixed or non-significant associations between CU traits and conduct problems. Specifically, three out of four studies that measured different types of aggression found CU traits to be unrelated to reactive aggression (Li et al., 2017; Sng et al., 2018; Wang et al., 2015). This was in contrast to a positive association between CU traits and proactive aggression found in three studies (Li et al., 2017; Raine et al., 2014; Wang et al., 2015). Levy et al (2017) reported mixed findings dependent on informants, namely that teacher-reported CU traits, but not student-reported CU traits, correlated with documented history of antisocial acts. Wang et al (2017) reported that the association between CU traits and conduct problems was no longer significant when other psychopathic traits were controlled for. Taken together, the results were generally consistent with those from Western culture, with the exception of the association between CU traits and reactive aggression.

CU Traits and Neurocognitive/Neurodevelopmental Correlates

Data on associations between CU traits and theoretically-relevant neurodevelopmental or neurocognitive domains were available from 10 studies. Among the five studies that utilized biophysiological measures, CU traits were found to be associated with indices including reduced brain connectivity between the inferior frontal gyrus and striatum that is part of the inhibition control network (Zhang et al., 2015), poor function in empathy-related neural networks including the fronto-parietal network (Pu et al., 2017) and low levels of oxytocin (Levy et al., 2017). All three studies reported large effect sizes (d = .76 – 1.50). CU traits were, however, not found to be uniquely associated with electroencephalographic (EEG) activity (P3 amplitude) while processing novel or target stimuli (Gao et al., 2018), or resting heart rate (Raine et al., 2014).

Five studies investigated cognitive characteristics in relation to CU traits. Here, CU traits were found to be associated with executive function deficits (Kim & Chang, 2019) and reward dominance in an offender group (Law, 2012). Two studies also examined associations between CU traits and rating scale measures of empathy, both which found support for the inverse association typically reported in Western populations, and were consistent with other findings that found empathy-related neural networks to be implicated in CU traits (Chen, Fung, & Raine, 2019; Liu et al., 2018). Akmal and Foong (2018) further reported that fear of emotions and compassion from others predicted CU traits. The effect sizes varied greatly, ranging from .28 to 1.12.

CU Traits and Environmental Correlates

Among the 12 studies that included measures of environmental factors, eight reported data on parent or family-based variables in relation to CU traits. Five family-based studies

found direct associations between severity of CU traits and positive parenting (inverse relationship), negative parenting, insecure attachment styles, as well as parental distress and helplessness (d = .22 - .80). In contrast, there was no significant association between CU traits and parental aggression (Sng et al., 2018), maternal psychopathic traits (Zhong et al., unpublished) and parental arrest (Li & Ang, 2019). With regard to interplay among such parenting variables and risk for conduct problems, Sng et al. (2018) found that Singaporean children's proactive aggression were more strongly affected by parental physical aggression when they have lower CU traits. Zhong et al. (unpublished) found that authoritarian parenting mediated longitudinal associations between maternal psychopathic traits and child CU traits. For youths with high CU traits, parental antisocial behavior appeared to be a particularly strong predictor of delinquency (Li & Ang, 2019).

A total of four studies reported on CU traits in relation to peer contexts or the school-environment. On one hand, Chu et al. (2014) found no association between deviant peer affiliation and child CU traits. On the other hand, CU traits were found to be associated with peer problems (Yoshida et al., 2019). Additionally, callousness was associated with being a victim of physical bullying and a perpetrator of verbal/relational/physical bullying (Wang et al., 2019a). In terms of school engagement, Hwang et al. (unpublished) reported a positive association between CU traits and teacher rewards, but no association with harsh teacher discipline. They also identified a moderator effect, whereby harsh teacher discipline predicted reduction in school engagement only for children with low CU traits.

CU Traits and Treatment Outcomes

Our systematic literature search identified only three studies that reported data on CU traits in relation to clinical intervention, and they were all based on the same sample in Israel.

Among the sample of preschoolers with elevated levels of conduct problems, CU traits were found to respond to a parent training intervention in a Randomized Controlled Trial (RCT) design. Treatment effects on CU traits were also found to be mediated by reductions in ineffective parenting, and CU traits were in turn found to mediate treatment effects on child conduct problems.

Discussion

With regard to the first core question of the review, the majority of studies showed a positive association between CU traits and child and adolescent conduct problems, consistent with findings commonly reported in the Western culture (see review by Frick et al., 2014). The non-significant association between reactive aggression and CU traits reported in three out of four studies, however, warrants further investigation as it is incongruent with typical findings from Western samples, in which reactive aggression, like proactive aggression, has generally been associated with higher levels of CU traits (e.g., Enebrink et al., 2005; van Baardewijk et al., 2011).With regard to the second core question of the review, the emerging evidence regarding correlates of CU traits related to neurocognitive and neurophysiological factors was found to be largely consistent with such evidence from Western samples. For instance, it was reported that children with high CU traits in Asian samples had atypical neural activation during cognitive tasks, and were less responsive to punishment when they were first primed to a reward-oriented response. These findings were consistent with available data from the United States and European countries (e.g., de Wied et al., 2012; Finger et al., 2008; Fisher & Blair, 1998; Frick et al., 2003; O'Brien & Frick, 1996; White et al., 2013). Consistent also with Western data were findings that CU traits in Asian youths were associated with reduced indices of empathy. While two studies reported non-significant associations between neurophysiological indices and CU traits (Gao et al., 2018; Raine et al.,

2014), the novel nature of these tests was such that comparable tests have yet to be conducted in Western samples. This evidence on the whole, though limited, suggests that notwithstanding influences that cultural factors may have on the presentation and expression of CU traits in Asian populations, they nonetheless implicate neurodevelopmental risk processes consistent with trajectories of CU traits in Western populations.

In terms of the third major focus of the review concerning environmental correlates of CU traits and related risk processes, the evidence reported for Asian samples was again largely consistent with international research. Findings associating CU traits with insecure attachment were in line with findings from Western populations, that disruptions to caregiving in early life, emotional deprivation, and attachment insecurity increased risk for CU traits (e.g., Campbell, Porter, & Santor, 2004; Dadds et al., 2011; Farrington, 2007). Sng et al (2018) also replicated findings in Western studies that have typically found negative parenting and related family environment variables to be more strongly associated with conduct problems among children with low levels of CU traits relative to those with high CU traits (e.g., Hipwell et al., 2007; Oxford, Cavell, & Hughes, 2003). In considering possible cross-cultural differences, it is important to note that evidence regarding such associations has often been mixed within Western samples (see review by Waller et al., 2013), and it is therefore not surprising that such findings were also somewhat mixed among the Asian studies examined here (e.g., Li & Ang, 2019). Cross-cultural research will be needed to examine specific dimensions of parenting and their associations with CU traits (e.g., parental aggression; Sng et al., 2018) to determine if cross-cultural differences exist.

In terms of peer correlates, the limited number of studies (four) precludes any clear conclusion. Nonetheless, Wang et al. (2019) found that callous traits were associated with bullying in a sample of Taiwanese youth, similar to findings previously reported for Western samples (e.g., Fanti et al., 2019; Muñoz, Qualter, & Padgett, 2011; Viding et al., 2009).

While findings from Western studies have associated CU traits with deviant/gang peer affiliation (e.g., Thornton et al., 2015), Chu et al (2014) reported no such association. Various factors could have contributed to the difference in finding, including a difference in the meaning of gang membership in Singapore, and methodological limitations (lack of reliability measure, relatively small all-male offender sample). More research is needed to further investigate this.

Research regarding treatment outcomes related to CU traits, the final focus of the review, was particularly limited among the studies identified. Aside from recent Israeli research reporting the effects of treatment on CU traits in one sample of preschool children (e.g., Somech & Elizur, 2009), research using treatment-related designs has yet to be conducted in any other Asian countries. This is not surprising considering that Hawes et al (2014) only identified 16 treatment outcome studies among the many other studies of CU traits in international research, and reported methodological limitations such as shared method variance in these studies. More research will be needed to determine if CU traits are associated with relatively poor treatment outcomes among youths with conduct problems in Asian samples.

The studies identified by our systematic search featured a number of common methodological limitations (see Table 2). Many relied on single-informant ratings to measure CU traits and related variables, and following from this, shared method variance was a common issue across these studies. Many studies also included limited psychometric information regarding the performance (e.g., reliability) of CU traits measures in the respective samples. Furthermore, it is important to note that a broad range of factors (e.g., sample type, age range, informant type) may have potentially contributed to the differences in findings reported in the identified studies, and it is premature to conclude that any differences are due to cross-cultural effects. Indeed, no cross-cultural comparison studies were identified

in our review. Due to the emerging state of research on CU traits in Asian countries, we have reported findings as a whole. We are, nonetheless, cognizant that there is great diversity in culture and societal norms among different Asian countries, and findings cannot be assumed to generalize across all Asian countries. Moreover, existing research has only been conducted on East, West and South East Asian populations, while research in other highly populated regions (e.g., the Indian subcontinent) is absent.

Notwithstanding these limitations, our review highlights the important advances that have been made in this research in recent years, and points to key directions for future research. First, ongoing psychometric research into the measurement of CU traits in Asian countires (e.g., investigating indices of reliability and validity in specific populations) stands to facilitate further research in these regions. From our review, the ICU emerged as a key candidate for such research, given that there is preliminary support for its use in a range of ages and formats, and across a range of countries. Where translations are involved, it is important that procedures follow best-practice guidelines (e.g., translation and back-translation method; Banville, Desrosiers & Genet-Volet, 2000). Second, cross-cultural research is recommended, especially in areas where findings from Asian samples have appeared to diverge from established findings in Western samples (e.g., associations between CU traits and reactive aggression, as well as peer influence). Such cross-cultural studies may serve to test direct comparisons between different countries (e.g., Chen et al., 1998) or to investigate cultural factors (e.g. values) as potential moderators of associations between CU traits and key correlates (e.g., Oh, Falbo, & Lee, 2020). It will be important for future research to review and synthesize evidence from studies of direct comparisons between Asian and other cultures when sufficient research of this kind is available. Third, with regard to research questions, there is a need for studies to investigate influential findings in Western research have yet to be investigated in Asian samples, such as associations between CU traits

and responsiveness to fear cues, and CU traits and predictors and moderators of treatment outcomes. Where possible, such studies would benefit from incorporating longitudinal designs, multi-informant measurement, and multivariate approaches (e.g., controlling for levels of aggression and impulsivity) to identifying unique associations with CU traits.In conclusion, evidence regarding CU traits among children and adolescents in Asian countries has grown rapidly in recent years, with the majority (72%) of the published studies identified in our systematic search published in the last five years alone. When considered on the whole, these studies appear to support the generalization of findings regarding CU traits from the Western countries in which they have most often been researched, to the range of Asian countries surveyed in this review. Some points of divergence are also apparent, yet based on the emerging state of this evidence it is premature to conclude that divergent findings necessarily reflect the effects of culture. Ongoing research is needed to better understand the expression of CU traits across cultures and the potential role of culture in risk processes related to CU traits.

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Table 1

Characteristics of Included Studies

Study	Country	N	Sample Type	Age (yrs)	% female	CU Traits Measure	Reliability of CU Traits Measure
Cross-sectional studies							
Akmal & Foong (2018)	Malaysia	177	Offenders	13 – 18 (M=16)	75.7%	ICU (Y), 24 items	Alpha = .62
Chen et al (2019)	Hong Kong	4,676	Community	8 – 18 (M=11.80)	38.0%	APSD (P, Y), 6 items	Alpha = .58
Chu et al (2014)	Singapore	168	Offenders	13 – 18 (M=15.00)	0%	YPI (Y), 15 items	No information on reliability.
Eremsoy et al (2011)	Turkey	71	Community	8 – 11 (M=9.37)	47.9%	APSD (P, T, C:P+T), 6 items	Alpha = .73 - .76. Inter-rater correlation = .54. Test-retest correlation = .63-.73.
Fung et al (2009)	Hong Kong	3,675	Community	11 – 16 (M=13.25)	47.0%	APSD (P), 6 items	Alpha = .58. Significant but variable factor loadings: 2 items with loadings <.2.
Gao et al (2018)	Hong Kong	301	Community	8 – 19 (M=11.35)	36.5%	APSD (C:P + Y), 6 items	Alpha = .44, .48
Law (2012)	Hong Kong	181	Offenders, community	12 – 17 (M=14.24)	0%	ICU (Y), 24 items	Alpha = .78
Levy et al (2017)	Israel	67	At-risk	15 – 19 (M=16.2)	0%	ICU (T, Y), 24 items	Alpha = .71, .86. Inter-rater correlation not significant. Teacher-report significantly higher than youth self-report (d=.55).
Li & Ang (2019), Li et al (2017)	Singapore	1,027	Community	12 – 19 (M=14.10)	40.3%	APSD (Y), 4 items	Alpha = .56. Factor loading of .41 - .8.
Liu et al (2018)	China	860	Community	M=11.54	47.9%	ICU (Y), 24 items	Alpha = .83.
Pu et al (2017)	China	83	Clinic-referred, community	M=15.0	0%	APSD (Y), 6 items	No information on reliability.

Raine et al (2014)	Hong Kong	334	Community	11 – 17 (M=13.22)	41.6%	APSD (P), 6 items	No information on reliability in current sample.
Sng et al (2018)	Singapore	282	Clinic-referred	7 – 16 (M=10.6)	12.4%	APSD (Y), 4 items	Alpha =.61. MIC =.20.
Somech & Elizur (2009)	Israel	136	Community	12 – 18 (M=15.02)	0%	ICU (Y), 11 items (Callousness)	Alpha = .70
Wang et al (2015)	China	501	Community	11 – 15 (M=13.12)	46.1%	APSD (Y), 4 items	Factor loading >.3. MIC= .20. Alpha = .50.
Wang et al (2017)	China	2,081	Community	11 – 19 (M=14.27)	49.2%	APSD (Y), 6 items; YPI (Y), 15 items; YPI-S (Y), 6 items	Alpha = .66 (YPI), .54 (YPI-S), .26 (APSD). MIC = .12 (YPI), .17 (YPI-S), .06 (APSD). Significant but weak correlation between scales: .2 (YPI and APSD), .12 (YPI-S and APSD). Omega hierarchical subscale (ωHS) = .56 (YPI-S), .40 (YPI).
Wang et al (2018)	China	686	Community	6 - 12	48.1%	CPTI (P, T), 10 items	Factor loading = .55 - .85. Alpha = .86 (mother), .92 (teacher). MIC = .37 (mother), .52 (teacher). Weak but significant inter-rater correlation
Wang et al (2019a)	Taiwan	613	Community	13 – 19 (M=16.0)	43.2%	ICU (Y), 24 items	Alpha = .74 -.82.
Zhang et al (2015)	China	29	Clinic-referred	14 – 17 (M=15.14)	0%	APSD (Y), 6 items	No information on reliability.
Zhang et al (2017)	China	579	Clinic-referred, community	6 – 13 (M=8.60)	34.9%	APSD (P), 6 items	Alpha = .7.
Longitudinal studies							
Deng et al (unpublished)	China	361	Community	9 – 13 (M=10.42)	51.9%	CPTI (P), 10 items	Alpha = .89
Hwang et al (unpublished)	South Korea	218	Community	10 – 12 (M=11.03)	48.0%	UNSW-R (Y), 9 items	Alpha =.73, .74 Stability over 9 months, r = .46.

Kim & Chang (2019)	South Korea	643	Community	4 – 5 (M=4.25)	49.0%	CBCL (P), 5 items	Alpha = .53. Weak internal reliability in earlier studies.
Yoshida et al (2019)	Japan	9,797	Community	6 – 15 (M=11.00)	49.8%	ICU (P), 12, 24 items	Alpha = .75, .82.
Zhong et al (unpublished)	China	410	Community	8 – 11 (M=10.41)	52.0%	ICU-11 (P, Y), 11 items	Alpha = .79, .85. Inter-rater correlation = .28.
Intervention Studies							
Elizur et al (2017), Somech & Elizur (2012), Elizur & Somech (2018)	Israel	209	At-risk	3 – 5 (M=4.05)	22.0%	APSD + ICU (P), 11 items	Alpha = .81. New composite measure not validated.

Note: APSD, Antisocial Process Screening Device; YPI, Youth Psychopathic Trait Inventory; ICU, Inventory of Callous-Unemotional Traits; YPI-S, Youth Psychopathic Traits Inventory Short version; ICU-11, Inventory of Callous-Unemotional Traits Short Form; CPTI, Child Problematic Traits Inventory; CBCL, Child Behavior Checklist; UNSW-R, University of New South Wales CU Traits Index - Revised; P, parent; Y, youth; T, teacher; C, combined; MIC, Mean Inter-item Correlation.

Table 2:

Results of included studies presented according to research questions

Study	Key Study Results	Methodological Limitations	Methodological Strengths
a) Association between CU traits and conduct problems			
Elizur et al (2017)	CU traits correlated with conduct problems at pre-intervention (d =.63).	Parent report only. Male dominated sample. Novel measure of CU traits.	Focused age range.
Eremsoy et al (2011)	CU traits correlated with conduct problems (d=1.12 – 1.19).	Small sample.	Random sampling. Multiple informants. Focused age range. Good reliability of CU traits measure.
Fung et al (2009)	CU traits associated with aggression (d=.15) and delinquency (d=.21) after controlling for impulsivity and narcissism.	Parent report only. Low loading of 2 items on CU scale (APSD) and alpha =.58.	Large sample. Random sampling.
Hwang et al (unpublished)	CU traits associated with antisocial behavior cross-sectionally at both times (d=.41, .63), and predicted antisocial behaviors 9 months later (d=.37).	Youth self-report only. Novel composite measure of CU traits and antisocial behavior.	Longitudinal data over 9 months. Good retention rate in longitudinal data (98%). Focused age range.
Kim & Chang (2019)	CU traits correlated with externalizing behavior at age 5 (d=1.86).	Parent report only. Novel measure of CU traits with low internal reliability.	Focused age range.
Law (2012)	CU traits correlated with offender status (d =.61). CU traits higher in early-onset offending group (age 11 and below) than non-offending control group (d=.67). No difference between adolescent-onset offending group and control, nor between early-onset and adolescent-onset offending groups.	All male sample. Small sub-samples.	-
Levy et al (2017)	Teacher-reported CU traits (d=.87), but not student-reported CU traits, correlated with documented history of antisocial acts. Significant correlation between CU traits and conduct problems within same rater (d=.63 for self-report, d=1.58 for teacher report).	Small sample. All male sample.	Multi-method and multi-informant measurements.
Li & Ang (2019); Li	CU traits correlated with delinquency (d=.28) and proactive	Youth self-report only. Broad	Large sample.

et al (2017)	aggression (d=.45) but not reactive aggression. CU traits negative associated with reactive aggression in regression analysis (d=-.22).	age range.	
Raine et al (2014)	CU correlated with reactive (d=.37), proactive (d=.37) and total (d=.41) aggression.	Parent report only. Broad age range. No information on reliability of scales in current sample.	-
Sng et al (2018)	CU traits correlated with diagnostic severity of ODD and CD symptoms (d=.56), but not with reactive and proactive aggression.	Broad age range. Male dominated sample. Low alpha for CU traits scale with only 4 items.	Multi-method and multi-informant measurement.
Somech & Elizur (2009)	Callousness associated with conduct problems (d=.72). Endorsement of honour culture attitudes mediated the relationship between callousness and conduct problems.	All male sample. Broad age range. Subscale of callousness used. Poor participation rate (47%).	Purposive sampling to obtain full range of conduct problems. Multi-informant measurement.
Wang et al (2015)	CU traits correlated with Youth Self-Report (YSR) rule-breaking behavior (d =.25), and Reactive-Proactive Aggression Questionnaire (RPQ) proactive (d=.45) and total aggression (d =.31), but not with RPQ reactive aggression, and YSR aggression and externalizing behavior.	Youth self-report only.	-
Wang et al (2017)	CU traits measured by YPI and YPI-S correlated with rule-breaking (d=.65, .49) and aggressive behavior (d=.61, .47), but associations were no longer significant after controlling for other psychopathic traits including grandiose-manipulative and impulsive-irresponsible traits.	Youth self-report only. Broad age range.	Large sample. Multiple instruments for CU traits.
Wang et al (2018)	After controlling for socio-demographic variables, teacher and mother rated CU traits both correlated significantly with mother, father and child rated conduct problems (d=.41 - .87). However after also controlling for impulsivity and grandiose-deceitful factors, CU traits is uniquely related to conduct problems only when mother reported on both measures (d=.28).	-	Large sample. Multiple informants. Good response rate (95%). Analysis controlled for variables.
Yoshida et al (2019	CU traits associated with conduct problems cross-sectionally and longitudinally (1 and 2 years later)(d=1.47 - 1.90).	Parent report only. Broad age range.	2-year longitudinal study. Large sample. Good retention rate in longitudinal data (80%). 2

			models of ICU used. Analysis controlled for past levels of conduct problems.
b) Association between CU traits and neurodevelopmental/neurocognitive factors			
Akmal & Foong (2018)	Fear of compassion from others and fear of emotions from others predicted CU traits (d=.42).	Youth self-report only.	-
Chen et al (2019)	Higher CU traits correlated to lower self-reported empathy (d = -.28 for parent-report CU, d=-1.12 for self-report CU).	Broad age range. Low response rate in parent report (55%).	Large sample. Multiple informants.
Gao et al (2018)	CU traits not associated with abnormal attention to target and novel stimuli (P3 response).	Broad age range.	Multi-method and multi-informant measurements. Analysis controlled for age.
Kim & Chang (2019)	CU traits at age 5 correlated positively to executive function deficits at age 8 (d=.68).	Novel measure of CU traits with low internal reliability. Higher drop-out rates among higher income families.	Longitudinal data over 3 years. Good retention rate (89%). Focused age range.
Law (2012)	CU traits associated with reward dominance in offender sample (d=.51) but not in control group.	All male sample. Small sample.	Multi-method measurement. Analysis controlled for age and anxiety.
Levy et al (2017)	Among those with CD diagnosis, lower oxytocin levels associated with higher teacher-reported CU traits (d=1.07) but not self-reported CU traits.,	Small sample. All male sample.	Multi-method and multi-informant measurements.
Liu et al (2018)	CU traits associated with total empathy (d =-.75) as well as subscales of somatic (d=-.47), negative (d=-.65), cognitive (d=-.68), affective ((d=-.82) and positive (d=.85) empathy.	Youth self-report only.	Analysis controlled for age.
Pu et al (2017)	High CU traits associated with impaired dynamics between brain networks (fronto-parietal network and default mode network) found related to empathy (d=1.50).	Small sample. All male sample. No information on reliability.	Multi-method measurement.
Raine et al (2014)	No association between CU traits and resting heart rate.	Parent report only. Broad age range. No information on reliability of CU traits measure.	Multi-method measurement. Good test-retest reliability (*r*=.92) of measure for heart rate.
Zhang et al (2015)	CU traits negatively associated with effective connectivity in the	Small sample. All male	Multi-method

	inhibition control network (between the Inferior Frontal Gyrus (IFG) and striatum)(d= -.76, -.79).	sample with adolescent-onset CD. No information on reliability.	measurement. Focused age range.
c) Association between CU traits and environmental risk factors			
Akmal & Foong (2018)	CU traits related to attachment styles (d=.45). Significant mean difference between Dismissive-Avoidant Attachment and Fearful-Avoidant Attachment, and between Dismissive-Avoidant Attachment and Anxious-Preoccupied Attachment.	Youth self-report only. 4-item only attachment questionnaire.	-
Chu et al (2014)	No significant difference in CU traits between gang and nongang-affiliated youth offenders.	Male sample only. No information on reliability.	Multiple informants on gang-affiliation.
Deng et al (unpublished)	Children with positive maternal parenting associated with lower CU traits than those with negative maternal parenting. Children with positive paternal parenting associated with lower CU compared to those with negative or mixed paternal parenting.	Parent report only.	Validated measures in Chinese populations. Tested longitudinal associations between parenting and child CU traits over 2.5 years.
Elizur et al (2017)	CU traits correlated with parental distress (d=.72), parental helplessness (d=.80), negative/inconsistent parenting (d=.30), and positive parenting (-.41) at pre-intervention.	Parent report only. Male dominated sample. Novel composite measure of CU traits, unemotional factor excluded. Translated questionnaires (Hebrew).	Focused age range.
Hwang et al (unpublished)	CU traits not related to harsh teacher discipline. Harsh discipline predicted decrease in school engagement only for children with low CU traits (d=.34). Greater use of reward strategies associated with lower CU traits cross-sectionally, at both time points (d=-.45, -.52). Higher CU traits predicted reduced use of teacher rewards over time (d=-.43). Teacher rewards did not affect CU traits over time.	Youth self-report only. Novel composite measure of CU traits.	Longitudinal data over 9 months. Good retention rate in longitudinal data (98%).
Kim & Chang (2019)	CU traits negatively correlated to maternal warmth at age 5 (d=-.32). Maternal warmth did not moderate effect of CU traits on social competence.	Novel measure of CU traits with low internal reliability. Higher drop-out rates among higher income families.	Longitudinal data over 3 years. Good retention rate in longitudinal data (89%). Focused age range.
Li & Ang (2019)	CU traits not related to parental arrest. Stronger effect of parental arrest on delinquency for high CU traits.	Youth self-report only. Broad age range.	Large sample.

Sng et al (2018)	No correlation between CU traits and parental aggression (physical or psychological). Parental mild and severe physical aggression was more strongly associated to proactive aggression in children with low CU traits (d=-.4). No moderator effect of CU traits on parental aggression and child reactive aggression.	Broad age range. Male dominated sample. Low alpha for CU traits scale with only 4 items.	Multi-informants. Moderator analysis controlled for socio-demographic variables.
Somech & Elizur (2009)	Callousness correlated with insecure attachment (d =.52).	Males only. Broad age range. Youth report only. Subscale of callousness used. Poor participation rate (47%).	Purposive sampling to obtain full range of conduct problems.
Wang et al (2019a)	Callous trait associated with higher risk of being victim of physical bullying (d=.10) and perpetrator of verbal/relational bullying (d=.08) and physical bullying (d=.09). Unemotional trait associated with higher risk of being victim of verbal/relational bullying (d=.12). No relationship between uncaring trait and bullying.	Youth self-report only. Broad age range.	Good response rate (92%).
Yoshida et al (2019)	Higher CU traits associated with higher levels of peer problems cross-sectionally (d=.57, .66).	Parent report only. Broad age range.	Large sample. 2 models of ICU used.
Zhong et al (unpublished)	Maternal psychopathic traits did not directly predict child CU traits. Authoritarian parenting predicted CU traits (d=.22, .68) while authoritative parenting only predicted mother-reported CU traits (d=-.75) but not child-reported CU traits. Relationship between maternal psychopathic traits and child CU traits was mediated by authoritarian parenting (d=.28, .38). Authoritative parenting mediated the association between maternal psychopathic traits and mother-report CU traits (d=.26), but not child-report CU traits.	Higher attrition rate in sample with authoritative parenting style.	Multiple informants. Longitudinal data over 18 months. Low attribution rate (89% completed all 3 waves). Focused age range.
d) Association between CU traits and treatment outcomes			
Elizur et al (2017); Somech & Elizur (2012); Elizur & Somech (2018)	Significant reduction in CU traits for treatment group as compared to control group (d=.72), and improvement in CU traits is mediated by reduction in ineffective parenting. Treatment effects on CU traits maintained at 1-year follow-up. Post-treatment CU traits mediated treatment effects on follow-up conduct problems.	Parent-report only. Male-dominated sample. Novel composite measure of CU traits, unemotional factor excluded.	Focused age range. Randomized controlled trial (RCT). Good retention rate at post-intervention (87%) and follow-up (60%).