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Practitioner Review: Involving young people with callous unemotional traits in treatment – does it work? A systematic review.

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This paper is the first systematic review of the evidence for individual-focused interventions for antisocial behavior in young people with callous unemotional (CU) traits. Whilst a review of parenting interventions for children with CU traits has been carried out (Waller et al., 2013), there has been no previous review of interventions involving direct work with young people. Given that parenting interventions are not always successful and do not have a strong evidence base based on studies of older children and adolescents, we think that it is important to provide a

clear overview regarding individual-focused treatments. We think that such a review is particularly timely, given the DSM-5 CU traits specifier and the unfortunate, but widely held belief, that treatment is likely to be less successful in children with CU traits.

We ask two questions in our review. First, we asked whether individual-focused interventions directly reduce levels of CU traits? Second, we asked whether CU traits predict the effectiveness of individual-focused interventions for antisocial behavior? The extant evidence certainly suggests that whilst children with CU traits typically display more severe antisocial behavior, there are treatments that work to reduce both CU traits and antisocial behavior in these children. Interventions tailored to address specific areas of difficulty for children with CU traits may be particularly effective and we argue that further randomised controlled trials of tailored interventions such as behavioral therapy, CBT, interventions designed to increase positive emotion and emotion recognition training are needed.

Background: Children and adolescents with callous unemotional (CU) traits are at risk of severe and persistent antisocial behavior. It is commonly assumed that these children are difficult to treat but it has been proposed that they may benefit from being involved in interventions that go beyond typical parent training programs. **Aim:** This systematic review sought to answer two previously unanswered questions: Do interventions involving young people reduce levels of CU traits? Do CU traits predict the effectiveness of interventions for antisocial behavior involving young people? **Method:** Studies were included that adopted an RCT, controlled or open trial design and that had examined whether treatment was related to reductions in CU traits or whether CU traits predicted or moderated treatment effectiveness. **Results:** Treatments used a range of approaches, including behavioral therapy, emotion recognition training, and multimodal interventions. 4/7 studies reported reductions in CU traits following treatment. There was a mixed pattern of findings in 15 studies that examined whether CU traits predicted treatment outcomes following interventions for antisocial behavior. In 7/15 studies, CU traits were associated with worse outcomes, although three of these studies did not provide data on baseline antisocial behavior, making it difficult to evaluate whether children with high CU traits had shown improvements relative to their own behavioral baseline, despite having the worst behavioral outcomes overall. CU traits did not predict outcomes in 7/15 studies. Finally, a single study reported that CU traits predicted an overall increased response to treatment. **Conclusions:**

Overall, the evidence supports the idea that children with CU traits do show reductions in both their CU traits and their antisocial behavior, but typically begin treatment with poorer premorbid functioning and can still end with higher levels of antisocial behavior. However, there is considerable scope to build on the current evidence base. **Keywords:** Callous unemotional traits; antisocial behavior; treatment; intervention.

Introduction

Research has long recognized different developmental pathways to antisocial behavior with important implications for basic research and interventions. A significant body of research in the last 20 years has focused on the presence of callous-unemotional (CU) traits, which designate a distinct subgroup of children with antisocial behavior (Frick, Ray, Thornton, & Kahn, 2014; Frick & Viding, 2009). Children with high levels of CU traits appear distinct from their low-CU peers in etiology (with a stronger genetic predisposition to antisocial behavior), prognosis (increased risk of developing persistent antisocial behavior), and pattern of neurocognitive vulnerability (atypical affective/empathic processing, accompanied by functional and structural brain abnormalities in emotion processing and regulation areas) (Frick & Viding, 2009; Viding & McCrory, 2012). Important questions remain regarding how CU traits impact the response of children receiving treatment for antisocial behavior, and particularly the issue of whether children with CU traits require specific, tailored intervention components.

Drawing on the extant evidence highlights a number of considerations for prevention and treatment. First, the presence of high-CU appears to index a genetically vulnerable subgroup of children for whom *early* intervention may be paramount to prevent persistent antisocial behavior from developing (Viding & McCrory, 2012). Second, there are neurocognitive characteristics specific to children with high CU traits that could guide individualization of treatments (Frick et al., 2014). Third, despite some evidence that negative/harsh parenting practices are not related to antisocial behavior in children with high-CU (e.g., Oxford, Cavell & Hughes, 2003; Hipwell et al., 2007; Wootton, Frick, Shelton & Silverhorn, 1997), there are suggestions that children with high CU traits do appear particularly responsive to warm parenting practices and respond to parenting-focused interventions (for a systematic review, see Waller, Gardner, & Hyde, 2013).

A growing number of studies have examined the factors accounting for variation in CU traits in naturalistic settings, with a focus on aspects of the parenting environment (e.g., Pasalich, Dadds, Hawes, & Brennan, 2011; Waller et al., 2014). A review by Waller et al. (2013) found

that several parenting-focused prevention and targeted interventions were directly related to reductions in child CU traits. Moreover, studies included in the review that had a control group suggested that CU traits did not moderate effectiveness of interventions targeting antisocial behavior (e.g., Hyde et al., 2013; Kolko & Pardini, 2010). Overall, the evidence suggests that the most effective interventions for children with CU traits are based on well-evidenced parenting programs, with the potential for personalization of treatment components that take into account affective processing characteristics of children (see Dadds et al., 2014; Hyde, Waller, & Burt, 2014; Waller et al., 2013).

However, while such parenting-focused interventions have shown promise (Waller et al., 2013), other treatment approaches could be equally or even more effective if used in isolation or in combination with parenting interventions. For example, a review by Salekin, Worley and Grimes (2010) examined studies predominantly from forensic settings (Falkenbach, 2003; O'Neil, 2003; Spain, 2004). Overall, Salekin and colleagues concluded that although psychopathic traits (i.e., including CU traits) were associated with more antisocial behavior during treatment, there was also evidence that young people either benefited or at least did not do worse across the majority of studies. A more recent review (Hawes, Price & Dadds, 2014) examined the effectiveness of family-based interventions. Based on their included studies, Hawes and colleagues concluded that the presence of CU traits is typically associated with worse treatment outcomes as indexed by antisocial behavior. However, it is noteworthy that the majority of the studies that this conclusion was based on involved a single treatment condition and no control group. Based on this evidence, CU traits could only be considered a 'predictor' not a 'moderator' of outcomes. However, three studies included in the Hawes et al. (2014) review did test moderation. Out of these, an RCT of a brief parenting intervention found that CU traits did not moderate intervention effectiveness (Hyde et al., 2013). However, it is worth nothing that this study did not include a clinic-referred but rather a high-risk sample, the intervention comprised three annual assessments with motivational interviewing and the option of additional parenting sessions, and CU traits were not measured before the intervention was given, making it hard to compare the findings alongside focused treatment studies of clinic-referred or forensic samples. The two other moderation studies that were discussed by Hawes et al. (2014) will also be considered in the current review as they directly involved the young person in the therapeutic process (Dadds et al., 2012; Manders et al., 2013; see section *'Do CU*

traits predict or moderate outcomes of interventions for antisocial behavior?). Also included in the review by Hawes and colleagues were four other studies involving therapeutic work targeting both children and parents, all of which are considered in the current review and which did not test moderation.

Beyond working with parents or targeting family processes, a variety of treatment strategies directly and exclusively involving young people, such as cognitive behavioral therapy, social skills training, and problem solving skills training, appear effective for reducing antisocial behavior (Scott, 2008). Given the well-established clinical heterogeneity of Conduct Disorder, there has been interest in tailoring treatments depending on features, such as age of onset, presence of CU traits, aggression, and comorbidity, including ADHD or other emotional disorders (Klahr & Burt, 2014). Thus, it has been proposed that interventions that target specific youth behaviors and characteristics, for example social skills training in the earlier-onset group and anger management for the more reactively aggressive, may be effective (Klahr & Burt, 2014; Hyde et al., 2014). Further, it may not always be possible to effectively implement parenting-focused interventions. For example, treatment of adolescents who are in juvenile justice facilities rarely involves parents. Moreover, even in settings where parents are engaged, (e.g., clinics), there are challenges to focusing on parenting, including parental compliance, attendance, premature drop-out, and participation barriers (lack of transport and childcare) (e.g., Axford, Lehtonen, Tobin, Kaoukji, & Berry, 2012; Baker, Arnold, & Meagher, 2011; Bumbarger & Perkins, 2012).

Despite the promise of tailoring interventions to target specific heterogeneity with youth antisocial behavior, no systematic review has examined the effectiveness of interventions that involve direct therapeutic work with high-CU children. The current review seeks to address this gap in the literature and add to the evidence base for what works when treating antisocial behavior in high-CU children. First, we examine whether treatments for antisocial behavior involving young people are directly effective in reducing levels of CU traits. Second, we examine whether high CU traits predict the effectiveness of these treatments for antisocial behavior, and consider within this question whether CU traits are related to lower treatment effectiveness (i.e., what previous studies have referred to as 'moderation').

Methods

Criteria for considering studies for this review

Types of studies. Randomized controlled trials (RCT), controlled trials with different conditions but no randomization process, or open trials with only one treatment condition.

Types of participants. Children up to age 18 participating in an intervention.

Types of interventions. Any intervention or treatment that directly targeted behavior or socioemotional/cognitive processing.

Types of measures. CU traits using a previously-validated or published measure. Antisocial behavior as captured by a previously validated measure or by recidivism data.

Search methods for identification of studies

Electronic search. A systematic search was performed of the following databases: MEDLINE, PsycINFO, EMBASE and CINAHL. The following search terms were used: (adolescen* boy* child* girl* infant* juvenile* preadolescen* pre-adolescen* preschool* pre-school* schoolchild* toddler* teen* young youth) AND (callous sociopath* unemotional psychopath psychopathic psychopathy) AND (treatment intervention therapy therapeutic training management trial program programme medication stimulant). No date, publication, or language restrictions were imposed.

Selection of studies. The search identified 1446 studies. A sizeable proportion was not retained because they did not use trial conditions or did not assess antisocial behavior or CU traits. The full texts of 34 potentially relevant studies were examined to assess whether they met the inclusion criteria. 15 were subsequently excluded either because they had no measure of CU traits or antisocial behavior, the intervention did not directly target CU traits or antisocial behavior, the intervention exclusively targeted parenting, or because an exclusively high-CU sample was recruited leaving unanswered the question of whether high-CU act as a predictor of treatment efficacy. The final pool comprised 19 studies published between 2003 and 2014.

Results

Included studies

Table 1 summarizes characteristics of the 19 included studies. 17 studies were carried out in the United States, one study in Australia, and one in Holland.

Measures

CU traits. 13 studies used the 6-item CU traits scale of Antisocial Process Screening Device (APSD; Frick & Hare, 2001; parent or teacher version). Five studies used the Interpersonal-affective trait ratings of Psychopathy Checklist Youth Version (PCL:YV; Forth, Kosson & Hare, 2003), which is a clinician-rated tool utilizing file information and semi-structured interview data. The affective part of this scale represents an index of CU traits. Four studies assessed CU traits via parent/teacher/self-reports on the Inventory of Callous Unemotional Traits (ICU; Frick, 2004. This is a fuller (24-item) measure designed to overcome psychometric limitations of earlier measures (e.g., APSD). Finally, two studies used parent/teacher ratings on the Child Psychopathy Scale (CPS; Lynam, 1997).

Antisocial behavior. A number of validated measures of antisocial behavior were employed by studies (Table 2). Several studies utilized non-standardized staff reports of antisocial behavior, limiting the generalizability of their findings. However, an advantage of staff report is that it provides a more holistic rating of youth behavior based on observations over time. Four studies used recidivism or arrest as a primary outcome, although this has the limitation of only quantifying antisocial behavior that is detected by the criminal justice system.

Intervention characteristics. Nine of 19 studies employed more than one treatment modality. The interventions were mainly psychosocial, but six studies included a pharmacological component. Four studies included parent training within the treatment package but were included here as the other intervention components met our inclusion criterion. For clarity, we group the findings from the studies into two categories: general psychotherapeutic interventions; and interventions targeting specific characteristics.

General psychotherapeutic interventions

Behavioral and cognitive behavioral therapy. Six studies used cognitive behavioral therapy (CBT), either individually or in groups. A 'mental models' approach, used in a single study in this review also incorporated aspects of CBT, as well as motivational techniques that aimed to foster positive emotion and interpersonal relations by encouraging children to focus on their strengths, problem solving, ability to identify emotions, and plans for the future. A single study evaluated cognitive-based compassion therapy, which uses mindfulness techniques. Finally, three studies specifically evaluated the effect of behavioral therapy.

Systemic or parenting approaches. Systemic or parenting interventions were used in six studies.

Psychoeducation. Providing health education about behavior and emotions to young people and their families was the primary focus of intervention in two studies.

Interventions targeting specific characteristics related to CU traits or antisocial behavior

Emotion recognition training. Emotion-recognition training incorporating the program 'MindReading' (Baron-Cohen et al, 2004), hypothesized to target deficits in emotion-recognition seen in high-CU children, was used in one study.

Social skills training. Four studies evaluated the effectiveness of treatments that included social skills training. This intervention component focuses on enhancing social behavior, including communication and responding to the verbal and non-verbal cues of others.

Anger management. Two studies incorporated an intervention component that focused on improving anger management (Lochman et al., 2014; Masi et al., 2011).

Stimulant medication. Stimulant medication for symptoms of Attention Deficit Hyperactivity Disorder (ADHD) was used in five studies, but only in conjunction with other treatment modalities, including other psychotropic medications in one study. The use of medication was also included in treatments in forensic settings, but differences in outcome depending on exposure to medication were not reported and therefore caution must be exercised when considering the efficacy of the psychosocial interventions in this context.

Synthesis of results

Studies were conducted across a range of settings (e.g., secure forensic, community) and participants (e.g., adolescent offenders, younger children with early behavioral problems). Further, the duration and intensity of interventions ranged across studies. Because of this heterogeneity, results were not combined in a meta-analysis. The effectiveness of the intervention, or relationship of CU traits to outcomes, was thus evaluated via a narrative synthesis in relation to the two research questions: Do interventions involving young people directly reduce levels of CU traits among children and adolescents? Do CU traits predict the effectiveness of interventions for antisocial behavior involving young people?

Do interventions involving young people directly reduce levels of CU traits?

Seven studies assessed whether interventions were directly related to a reduction in levels of CU traits and four reported significant reductions in CU traits following treatment. Kolko et al. (2009) found a reduction (moderate effect size) in CU traits across both treatment groups at three years follow up (12 week RCT of either community or clinic based medication, CBT, social skills training and family therapy, n=139). Salekin et al. (2012) reported that a 'mental models' intervention in a secure forensic setting was related to a post-treatment reduction in the CU traits (12 week open trial, n=24). This study had the advantage of evaluating a single direct treatment hypothesized to be effective in high-CU young people. Blader et al. (2013) reported a significant reduction in CU traits following an intervention with stimulant medication and concurrent family-focused behavioral treatment ina sample of 6-13 year olds with ADHD and aggressive behavior (open trial, mean 10 weeks, n=160). A final study (Lochman et al., 2014) reported a significant reduction in CU traits among at-risk group of aggressive school children receiving a group intervention focusing on anger management and social skills, whose parents also received group-based parenting work (24 week RCT, n=241).

However, three studies reported no statistically significant reductions in CU traits following treatment. One examined the effectiveness of a cognitive-based compassion training using mindfulness techniques in at-risk group of adolescents in foster care (Reddy et al, 2013) in a 6 week RCT (n=71) with waiting list controls; another compared the effectiveness of multisystemic therapy (MST) to treatment as usual in an RCT (n=256) lasting 23 weeks (Manders et al., 2013); and a third focused on at-risk adolescents expelled from school and

targeted cognitive distortions proposed to be relevant to psychopathy (e.g. self-centeredness) (Norlander, 2008) in an 18 week RCT of a CBT intervention compared with treatment as usual. However, the sample in the latter study was small (*n*=34) and reported a trend towards a reduction in CU-traits, which may have failed to reach statistical significance due to power issues.

Do CU traits predict or moderate outcomes of interventions for antisocial behavior?

Forensic settings. Six studies examined whether CU traits predicted treatment outcomes within a forensic setting (two among forensic outpatients, one in a day hospital, and three in secure settings). 4/6 studies found that high levels of CU traits predicted worse treatment outcomes. However, three of these studies did not account for baseline severity of antisocial behavior (Falkenbach et al., 2003 in a 5 week open trial (n=69) of a psychoeducational intervention; O'Neill et al., 2003 in a 12 week open trial of CBT and group therapy (n=64) lasting 12 weeks; Spain et al., 2004 in an open trial (n=85) of behavioral therapy). As such, they likely picked up on the fact that young people with CU traits typically have more behavioral problems overall, meaning their pre-treatment levels of antisocial behavior were possibly also higher. These studies are thus unable to address the question of whether high CU traits were associated with a reduced response *to* treatment rather than just more severe antisocial behavior overall. In contrast, Caldwell (2011), in a controlled trial (n=248) of treatment in a secure setting using a combination of group and individual therapy and medication, did account for baseline antisocial behavior scores. While there was a trend towards adolescents with high CU traits demonstrating smaller reductions in their behavioral problems than their low-CU peers, the difference was statistically non-significant.

Importantly, two studies also reported that high-CU adolescents did no worse and/or better in response to treatment than other antisocial youth. First, Caldwell et al. (2007) found that although higher PCL: YV scores were associated with increased behavioral problems (assessed via the Today-Tomorrow Scale) at the beginning and end of treatment, they were not predictive of overall treatment response (open trial, n=86 lasting mean 45 weeks). Second, in a 9 week open trial of functional family therapy in a forensic setting (n=134), White et al. (2013) found poorer levels of functioning pre- and post-treatment in the high-CU adolescents, as might be expected. Nonetheless, they found that high levels of CU traits were related to improved treatment

responsiveness and greater reductions in behavioral problems indexed via parent- and youth-reported change scores in measures of emotional problems, aggression, and conduct problems. However, the significant association between treatment-related change scores and CU traits disappeared when controlling for pre-treatment scores indicating that severity (rather than CU traits specifically) accounted for the greater changes resulting from treatment. This study highlights the importance of accounting for pre-treatment severity to tease apart general reductions in antisocial behavior problems versus specific treatment effects that might be related to CU traits.

Clinic samples. Nine studies assessed whether CU traits predicted treatment outcomes for interventions targeting antisocial behavior among clinic samples. These studies typically assessed younger samples with diagnoses of Oppositional Defiant or Conduct Disorder; two adolescent studies were also conducted (Norlander, 2008; Manders et al., 2013). 4/9 studies found that high CU traits were associated with poorer treatment outcomes. Washbusch et al. (2007) examined the effectiveness of behavioral therapy and stimulant medication versus behavioral therapy alone in an 8 week RCT at a summer camp for children (n=37) with conduct problems and ADHD. Children with high CU traits demonstrated a smaller reduction in behavioral problems following treatment compared to low-CU children although this reduced response was less marked if high-CU children were also prescribed stimulant medication. Haas et al. (2011) examined the effect of behavioral therapy on children's conduct problems and ADHD in an open trial (n=54) also within a summer camp setting. High-CU children showed less of a reduction in behavior problems following treatment. Masi et al. (2013) examined the effectiveness of a multi-modal treatment package of individual therapy (self-control problem solving, role playing and social skills), parent-training and medication in a 12 week open trial (n=118) and found that high CU traits were significantly associated with non-responsiveness. Finally, Manders et al., (2013) found that multi-systemic therapy (MST) was more effective than treatment as usual in reducing externalizing problems in low-CU adolescents but not in those with higher levels of CU traits. Nevertheless, it is important to note that across all these studies, high-CU children did show some reduction in their antisocial behavior, but the reduction was often not as marked as that observed for low-CU children.

Four studies found that high-CU children were equally responsive to treatment than their low-CU peers. Norlander (2008) found among high-risk adolescents expelled from school that high-CU children showed comparable reductions in anger and impulsivity following psychopathy-focused CBT (in fact, there was a trend towards greater treatment response). Kolko and Pardini (2010) examined the effectiveness of community- versus clinic-delivered treatment components for children with CD or ODD within an RCT design (n=177) lasting 21 weeks. This study used the same sample as Kolko et al., (2009) but addressed a different question. Treatment components included CBT, parent training, family therapy, and medication. High CU traits were not related to treatment effectiveness although interestingly they did predict reductions in ODD symptoms over time. However, given the longer follow up in this study compared to other treatment trials (3 years), it may be that the changes in ODD symptoms were a developmental phenomenon rather than a treatment effect. Masi et al., (2011) examined the effectiveness of multi-modal treatment package in a 26 week open trial (n=38) comprising MST, parent training, CBT, and anger management on children's ODD and CD symptoms and found no statistically significant differences between high- vs. low-CU children (there was a trend level prediction of reduced treatment responsiveness, but this effect did not reach significance). In an open trial (n=160) lasting a mean of 10 weeks examining the effectiveness of stimulant medication and concurrent family focused behavioral treatment in 6-13 year olds with ADHD and aggressive behavior, Blader et al., (2013) found that high-CU children were no more likely to be aggressive following treatment than their low-CU peers.

Finally, in a 4 week RCT (n=195) examining the effectiveness of adjunct emotion-recognition training for a clinic sample of children with behavior problems treated using parenting intervention, Dadds et al., (2012) found that high-CU children showed more pre-treatment conduct problems and did worse in family-based treatment as usual. However, the addition of emotion-recognition training produced increased effectiveness of treatment for the high-CU children, suggesting the potential utility of these kinds of tailored adjunct treatment components.

Discussion

Antisocial behavior in young people causes considerable suffering and places a significant burden on public services. CU traits identify children and adolescents with severe and persistent antisocial behavior who have unique etiological risk, prognosis, and underlying socioemotional

and cognitive characteristics (Frick & Viding, 2009; Frick et al., 2014). In this systematic review, we synthesized evidence from studies examining the effectiveness of interventions that involved working with young people.

Direct reductions in CU traits following treatment

When CU traits are measured longitudinally in community samples, they show moderate to high stability across childhood and adolescence (Frick et al., 2014). Regardless, over half the studies included in our review that had examined whether these traits were responsive to treatment produced positive results. In other words, CU traits are by no means 'immutable' and showed reductions in response to direct therapeutic efforts (also see Waller et al., 2013). It is important to stress, of course, that studies reporting the stability of CU traits in the community document 'what is', rather than 'what could be' if an intervention was administered.

Our review highlights the importance of direct therapeutic efforts to reduce CU traits among clinic-referred, forensic, and high-risk samples. For example, Salekin and colleagues (2012) noted a decline in self-reported callousness following their 'mental models' intervention in a forensic setting. Although an examination of mediating effects was not possible with their study design, Salekin and colleagues hypothesized that increases in positive affect could produce reductions in CU traits. In addition to positive affect, interventions targeting general behavioral problems could help target a callous interpersonal style, particularly if this outcome stems from adverse life experiences (e.g., Kimonis, Centifanti, Allen, & Frick, 2014). This explanation could, in part, account for the decreases in levels of CU traits reported in the trial of mixed package treatment including CBT, medication, family therapy and social skills work (Kolko et al., 2009), where changes in CU traits could have occurred as a response to improvements in general antisocial behavior over the three year follow-up, although potential reciprocity between the CU traits and antisocial behavior over time was not explicitly tested. It is also interesting to note that if a child's general antisocial behavior improves following intervention, changes in parental response may follow and which, in turn, could also facilitate reductions in CU traits over time. Overall, the fact that half of the studies with individual-focused components in this review reported reductions in CU traits, especially when considered alongside similar outcomes reported in parenting interventions (see Waller, et al., 2013), should encourage clinicians

working with these children and motivate further research into interventions directed at high-CU children.

CU traits as a predictor or moderator of treatment response

It is difficult to draw firm conclusions about the effect of CU traits in response to treatments aimed at reducing antisocial behavior. Certainly the most frequent finding (7/15 studies) was that outcomes, as measured by recidivism or post-treatment antisocial behavior, were worse among high-CU children. This appears in keeping with the extant research that these children exhibit a distinct risk profile and are more likely to persist in antisocial behavior (Frick and Viding, 2009). However, it is important to note that only a minority of studies examining whether CU traits were related to treatment outcomes adopted an RCT design, which is required to establish whether CU traits moderate the effectiveness of a treatment. In contrast, open trials or studies with a single treatment condition can only test whether CU traits predict outcomes. Indeed, such 'prediction' studies should not be conflated with having tested 'moderation' because without a control group, it is not known how high-CU youth would have fared without treatment. This review thus establishes the need for future RCTs in the field.

Beyond this key issue of study design, 7/15 studies found that the presence of CU traits did not predict treatment response, and one study examining an adjunctive intervention (emotion recognition training) reported an increased response in high-CU children. Notably in this study, high levels of CU traits predicted worse response to treatment as usual (Dadds et al., 2012). However, the finding that reduction in antisocial behavior in the trial of emotion recognition training was not mediated by measurable improvements in emotion recognition indicates the need for future research to take into account other possible mediating factors, such as changes in parenting, parental perceptions, or parent-child interaction (Waller et al., 2013).

Methodological issues of included studies

Several methodological issues deserve consideration when evaluating the findings from included studies. First, many studies included measures of CU traits and antisocial behavior with poor psychometric properties. Second, over half of the studies (9/19) did not provide any follow-up data, which makes it difficult to assess whether improvements following treatment are sustained. Third, as outlined, fewer than half of the studies reviewed (8/19) had an RCT design,

which reduces the confidence with which we can draw definitive conclusions about the responsiveness of CU traits to treatment or whether the presence of CU traits has a 'moderating' (rather than a 'predictive') effect on outcomes. Fourth, nearly a third of the studies examining whether CU traits predicted outcome did not include baseline antisocial behavior scores. This is problematic given that young people with CU traits typically start treatment programs with the worst existing behavior problems. Indeed, evidence suggests that high-CU children do benefit from some available treatments for antisocial behavior, but their recovery to 'normative' levels of behavior is likely hampered by their poorer premorbid functioning and might require longer intervention time-frame (see Hyde et al., 2014). Fifth, high-CU children in some of the studies were explicitly diagnosed with comorbid disorders, particularly ADHD, and there is likely to have been significant clinical heterogeneity in many included samples. A clearer understanding of how ADHD symptoms and CU traits are related to each other is much needed. Recent work examining the nomological networks of CU, ADHD, and ODD behaviors, suggest that even brief parent-reported behavior scales can delineate subgroups with unique behavioral, socioemotional, and cognitive characteristics (see Waller, Hyde, Grabell, Alves, & Olson, 2014). Finally, many included studies evaluated a number of different interventions simultaneously. Research into a multimodal set of interventions is helpful to the extent that it provides a more naturalistic evidence base for treatment of young people who often require a flexible and individualized approach. However, it is not helpful for delineating the effective components of interventions, or indeed the number of sessions or length of intervention needed.

Future research

Overview

There is a pressing need for research into the treatment of antisocial behavior in high-CU children that can build on the work done thus far. The most persuasive evidence is likely to be produced by studies adopting RCT designs with large samples, the use of a treatment as usual allocation that allows for the testing of moderating influences of CU traits on treatment, and longer term follow-up data to assess for the presence of potential sleeper effects. However, smaller trials of novel interventions will also be useful in order to determine the future direction of research in this field. The finding that CU traits show decreases in middle-childhood following parenting interventions (Waller et al., 2013) and multimodal interventions (Kolko et

al., 2009) highlights the need for further trial evidence. Studies that examine associations between behavior changes, level of CU traits, and, ideally, alterations in parenting, would be especially helpful in considering the potential *mechanisms* for findings. Future studies would benefit from adopting multi-arm RCT designs, or even 'SMART' trials (Lei, Nahum-Shani, Lynch, Oslin, & Murphy, 2012), to isolate specific intervention components and sequencing of components that are most effective. Finally, not enough is yet known about the relative benefits of individual- versus family-level intervention. Future trials could address this limitation by randomizing to conditions with varying individual and parent components.

Specific interventions that target child characteristics

Research examining tailored interventions/add-ons with clearly-defined core clinical processes that can elucidate the impact of specific interventions (formulated based on the knowledge of the specific neurocognitive difficulties of children with CU traits) deserves particular attention. This is not to dismiss the utility of studies of multimodal interventions of antisocial behavior with a strong evidence base that take into account the often complex reality of treatment needs in young people and families. However, the data indicate that even when such programs produce improvements for high-CU children, the improvements are more modest. Even when improvements are comparable, baseline levels of antisocial behavior are typically higher for high-CU children, meaning they are less likely to fully remit. It is encouraging that some of the studies that have demonstrated improvements in the behavior of high-CU children have used interventions designed to target specific deficits. We now need further work evaluating the efficacy of treatments, such as modified CBT and emotion recognition training, that are designed to target aspects of socio-emotional functioning that are particularly problematic in high-CU children (cf., Salekin et al., 2012; Dadds et al., 2012).

More research is needed that examines differential responses among high- versus low-CU groups to varying components of behavioral therapy, in line with the hypothesis that high-CU children respond more to positive reinforcement (e.g., Hawes & Dadds, 2007). Such research would be improved by follow-up data that could assess whether improvements are sustained and generalized once a reward-focused behavioral intervention is completed. Finally, the finding that stimulant medication in combination with behavioral treatments for high-CU children with ADHD is associated with similar improvements in comparison with low-CU children

(Waschbusch et al., 2007; Blader et al., 2013) also warrants further investigation. It will be particularly useful for future studies to delineate further what effect, if any, stimulant medication has on proactive aggression in these children.

Mediators of intervention effectiveness

As well as examining the benefits of specific interventions, the evidence base will benefit from investigations of potential mediators of treatment efficacy, including the quality of parent-child relationships, as already discussed. Other potentially relevant factors include engagement with treatment and therapeutic alliance (e.g., Simpson, Frick, Kahn & Evans, 2013). Second, an association has been reported between high levels of CU traits and insecure attachment among clinic-referred boys (Pasalich, Dadds, Hawes & Brennan, 2012). It may be interesting to investigate interventions aimed at increasing caregiver sensitivity, which is thought to promote secure attachment, particularly among high-CU children (Bakermans-Kranenburg, van IJzendoorn & Juffer, 2003). However, any interventions seeking to promote change in parent-child attachment should also take into account child characteristics linked to high-CU, which may influence the attachment dynamic. Finally, the propensity to mentalize (sometimes termed "mind-mindedness") about other people may represent an important mediator of treatment effectiveness (Meins & Fernyhough, 2015). For example, among high-CU children, those who showed greater propensity to consider their attachment figure's mental states exhibited lower proactive aggression (Taubner, White, Zimmermann, Fonagy & Nolte, 2013).

Review limitations

The current review had several limitations. Due to the heterogeneous nature of the current evidence base, it was not possible to perform a meta-analysis of the available results. A meta-analysis would useful in the future in order to determine the magnitude of effect sizes for behavior change or differential effectiveness due to high levels of -CU traits following intervention. Indeed, there was substantial variation between studies in terms of setting, duration, modality and clinical population. While we sought to present studies according to key components of treatment, this was not always possible due to the way in which many modalities overlap (for example, MST frequently includes anger management even though the two are presented here as different interventions). Accordingly, it is difficult to draw conclusions about

the effectiveness of specific components of interventions for different settings, especially when treatment modalities were not delivered in isolation. Indeed, the paucity of replicated study designs meant that it was not possible to compare treatments according to duration or setting. Finally, despite the thoroughness of the search procedure, there may be unpublished findings (e.g., 'file-drawer' problem) or publications not written in English the search strategy failed to uncover.

Conclusion

There are encouraging indications that CU traits can ameliorate in response to treatment. However, the extant evidence also highlights that the treatment of antisocial behavior among high-CU children is challenging. In particular, even when these children respond equally well to treatment, their more severe initial behavior problems mean their post-treatment functioning is still worse than that of children with low-CU. Our review highlights that high-CU children may benefit particularly from treatments that target specific vulnerabilities and associated characteristics, which is an area for future research to explore systematically to help in the generation of more effective treatments. These treatments are likely to include behavioral therapy with a focus on positive reinforcement, CBT, emotion recognition training and interventions designed to increase positive emotion and stimulant medication, particularly when children have co-morbid ADHD. Future trial research is needed to build on the results from these tailored interventions.

Figure 1 PRISMA flow diagram

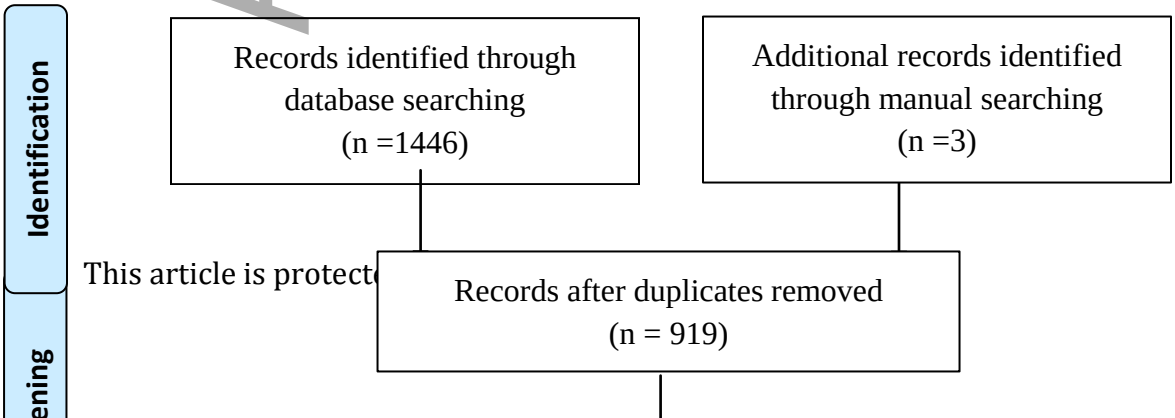

Table 1 Characteristics of included studies

Reference	Country	Sample size	% male	Age range (or mean)	Ethnicity	Sample type	Setting
Blader (2013)	US	160	78.8	6-13	Maj. Cauc	ODD/CD/ADHD	Clinic
Caldwell (2007)	US	86	100	-	Maj. Af Am	Offenders	Secure
Caldwell (2011)	US	248	100	17.1	Mixed	Offenders	Secure
Dadds (2012)	Aus	195	72	6-16	Not reported	ODD/CD/ADHD/ASD/Anx/Dep	Clinic
Falkenbach (2003)	US	69	60	9-17	Maj. Cauc	Offenders	Forensic outpatient
Haas (2011)	US	54	75.9	7-12	Maj. Cauc	CP/ADHD	Summer treatment camp
Kolko (2009)	US	139	85	6-11	Maj. Cauc	ODD/CD	Clinic
Kolko (2010)	US	177	-	6-11	Not reported	ODD/CD	Clinic
Lochman (2014)	US	241	63	9-12	Maj. Af Am	High risk - aggressive	School
Manders (2013)	Hol	256	73	12-18	Maj. Cauc	CP	Clinic
Masi (2011)	US	38	53	8-14	Not reported	ODD/CD	Clinic
Masi (2013)	US	118	86	6-14	Not reported	ODD/CD	Clinic
Norlander (2008)	US	34	70	14-18	Maj. Cauc	High risk – expelled	Clinic
O'Neill (2003)	US	64	100	15-18	Maj. Af Am	Offenders/substance misuse	Partial hospitalisation
Reddy (2013)	US	71	56	13-17	Maj. Af Am	High risk – in foster care	Clinic
Salekin (2012)	US	24	100	14.67	Maj. Af Am	Offenders	Secure
Spain (2004)	US	85	100	11-18	Maj. Cauc	Offenders	Secure
Waschbusch (2007)	US	37	68	7-12	Maj. Cauc	ADHD/CP	Summer treatment camp
White (2013)	US	134	71.6	11-17	Maj. Af Am	Offenders	Forensic outpatient

Note. ODD=Oppositional Defiant Disorder. CD=Conduct Disorder. CP=Conduct problems. ADHD=Attention Deficit Hyperactivity Disorder. ASD=Autistic Spectrum Disorder. Anx/Dep=Anxiety/depression

Table 2. Summary of interventions examined in included studies and measures employed

Reference	Type of intervention and setting	Duration in weeks	Study design	Comparison group	CU measure	AB measure	Length of FU in days
Blader (2013)	Stimulant medication, family focused behavioral intervention.	10 (mean)	Open	None	APSD (P)	RMOAS (P), CBCL (P), AQ (P)	None
Caldwell (2007)	Individual and group psychotherapy (predominantly CBT). Medication. Secure setting.	45 (mean)	Open	None	PCL:YV (C)	Today-tomorrow scale (C)	1538 (mean)
Caldwell (2011)	Individual and group psychotherapy (predominantly CBT). Medication. Secure setting.	-	Controlled	TAU	PCL:YV (C)	Behavioral assessment system (C) Re-offending	720-2370

Dadds (2012)	Emotion recognition training. Community based.	4	RCT	TAU	APSD (S,T,P)	SDQ (P,T)	182
Falkenbach (2003)	Psychoeducation. Forensic outpatient.	5 (minimum)	Open	None	APSD (P,S), CPS, (P,S)	Re-offending	365
Haas (2011)	Behavioral therapy. Summer treatment programme.	-	Open	None	APSD (P)	SIRF (C)	None
Kolko (2009)	Medication, CBT, social skills, parent training, family therapy. Community based.	12	RCT	Clinic based medication, CBT, social skills, parent training, family therapy	APSD (T)	CBCL (P), IOWA (P), SRA (S), TRF(T)	1095
Kolko (2010)	Medication, CBT, social skills, parent training. Community based.	21	RCT	Clinic based medication, CBT, social skills, parent training; TAU	APSD (T)	SRA (S), CBCL (P), TRF (T)	1095
Lochman (2014)	Group based social skills, problem solving, anger management. Separate parent intervention. Community based.	24	RCT	Control	APSD (T)	BASC (T), TRRPA (T)	1460
Manders (2013)	MST. Community based.	23 (mean)	RCT	TAU	ICU (P)	CBCL (P), YSR (S)	None

Masi (2011)	MST, parenting training, anger management, CBT. Community based.	26	Open	None	APSD (P,S) ICU (P,S)	CBCL (P), AQ (C), CGI-S (C)	None
Masi (2013)	'Multimodal' individual therapy (self control, problem solving, role playing, social skills), parent-training, medication. Community based.	12	Open	None	APSD (P)	CGI-S (C), C-GAS (C), CBCL (P)	None
Norlander (2008)	Psychopathy focused group-based CBT. Community based.	18	RCT	TAU	PCL:YV (C), APSD (S)	STAXI (S)	42
O'Neill (2003)	CBT+group therapy. Partial hospitalization.	12	Open	None	PCL:YV (C)	Staff rated Re-offending	365
Reddy (2013)	Cognitive based compassion training Community based.	6	RCT	Waiting list	ICU (P,S)	CBC (P)	None
Salekin (2012)	Mental models. Secure setting.	12	Open	None	APSD (S)	-	None
Spain (2004)	Behavioral therapy. Secure setting	-	Open	None	APSD (S), PCL:YV (C), CPS (S)	Staff rated	None
White (2013)	Functional family therapy. Forensic outpatient.	9 (mean)	Open	None	ICU (S)	BASC 2 (S,P) arrests	365
Waschbusch (2007)	Behavioral therapy. Summer treatment programme.	8	RCT	Behavioral therapy plus medication	APSD (P,T)	Staff rated. IOWA (T,C)	None

Note. RCT=Randomised controlled trial. TAU=Treatment as usual. CU measures - S=self, P=parent, T=teacher, C=clinician. PCL:YV=Psychopathy Checklist: Youth Version. APSD=Antisocial Process Screening Device. ICU=Inventory of Callous Unemotional Traits. AB=measure of antisocial behavior. Staff-rated=no standardised measure of antisocial behavior used. BASC-2=Behavior Assessment Scale for Children. SIRF=Staff improvement rating form. IOWA=Pittsburg modified Conners rating scale. RMOAS=Retrospective

Modified Overt Aggression Scale. DBD=Disruptive Behavior Disorders Rating Scale. SDQ=Strengths and Difficulties Questionnaire. SRA=Self Report of Antisocial Behavior. CBC=Child Behavior Checklist. TRRPA=Teacher Report of Reactive and Proactive Aggression. TRF=Teacher Report Form. YSR=Youth Self Report. AQ=Aggression Questionnaire. CGI-S=Clinical Global Impression Score. C-GAS=Children's Global Assessment Scale. STAXI=State-Trait Experience of Anger and Expression of Anger.

Table 3 Main study findings and limitations

Reference	Main findings	Limitations
Do interventions involving young people directly reduce levels of CU traits?		
Blader (2013)	↓ CU scores following treatment	Cronbach alpha not reported. No control group. High dropout rate.
Kolko (2009)	↓ CU scores in both treatment arms (d=0.44)	CU traits teacher-rated only. Not possible to isolate what part of treatment effective. No control. No TAU condition. Blinding of assessors to treatment condition not reported. Same sample as Kolko (2010).
Lochman (2014)	↓ CU scores in treatment group	Significant loss to follow up. Randomization procedure not reported.
Manders (2013)	No significant change in ICU scores	No follow up data.
Norlander (2008)	↓PCL:YV scores in treatment group (non-significant)	Cronbach alpha CU scale on APSD 0.46 and PCL:YV .70. Small sample size. Significant loss to follow up with no intention to treat analysis. Randomization procedure not reported.
Reddy (2013)	No significant change in ICU scores	Cronbach alpha not reported. Brief pilot study with no follow up.
Salekin (2012)	↓ CU facet in APSD	Cronbach alpha .5-.6. Small sample. No control.

		No behavioral outcomes. Reliance on self-report.

Note. Cronbach alphas refer to measures of CU traits

Do CU traits predict the effectiveness of individual-focused interventions for antisocial behavior?		
Blader (2013)	↑ CU scores not predictive of response	Cronbach alpha not reported. No control group. High drop out rate.
Caldwell (2007)	PCL:YV scores not predictive of treatment response or recidivism	No control group. Predictive effect of total PCL YV scores reported only. Variations in treatment approach and duration.
Caldwell (2011)	↑ affective facet on PCL:YV not predictive of treatment response or recidivism (although non-significant trend towards post-treatment ↑ behavioral problems and recidivism)	Not randomized. Variations in treatment approach and duration.
Dadds (2012)	↑ relative reductions in conduct problems following ERT as adjunct to parent training in those with ↑ CU scores (moderator effect)	Quasi-randomization by date of birth. Blinding of assessors to treatment condition not reported.
Falkenbach (2003)	CU-related subscales of both measures predictive of recidivism and ↓ treatment outcome	No baseline measure of antisocial behavior. No control group. Variations in treatment approach and duration.
Haas (2011)	↑ CU scores on APSD predict ↓ treatment response	Cronbach alpha not reported. Small sample. No control group. Well validated measure of behavioral difficulties not used.
Kolko (2010)	↑ CU scores not predictive of treatment response	Not possible to isolate what part of treatment effective. Variations in treatment frequency and duration in TAU arm. Same sample as Kolko (2009).
Manders (2013)	MST more effective than TAU in those with ↓ CU scores but not in those	No follow up data.

	with ↑ CU scores (moderator effect)	
Masi (2011)	↑ CU scores not predictive of treatment response (although non-significant trend towards ↓ response)	Cronbach alpha not reported. Small sample. No control group.
Masi (2013)	↑ CU scores predict ↓ response	Cronbach alpha not reported. No control group. Treatment outcome rated by therapists.
Norlander (2008)	↑ CU scores not predictive of treatment response (although non-significant trend towards ↑ response)	Cronbach alpha CU scale on APSD 0.46. Small sample size. Statistically non-significant findings. Significant loss to follow up with no intention to treat analysis. Randomization procedure not reported.
O'Neill (2003)	↑ Factor 1 PCL:YV scores predict ↓ treatment outcome	No standardized measure of behavioral outcomes or baseline measure of antisocial behavior. No control group.
Spain (2004)	↑ affective scores on mCPS (but not APSD or PCL:YV) predictive of ↓ treatment outcome	No standardized measure of behavioral outcomes or baseline measure of antisocial behavior. Alphas for APSD and PCL:YV "lower than desirable" but figures not reported. Inter-rater reliabilty of affective scale on PCL:YV .43.
Waschbusch (2007)	↑ CU scores associated with ↓ response to treatment (difference in response less marked when stimulant medication taken)	Cronbach alpha not reported. Small sample. No TAU or no treatment group.
White (2013)	↑ CU scores predictive of ↑ recidivism post-treatment and not significantly associated with treatment response	No control group. Follow up of arrest data only. Reliance on self-report of CU traits

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Key points

Key practitioner message

- Children with high CU traits are at risk of severe and persistent antisocial behavior.
- There is evidence that parenting interventions may be effective in these children, but individual-focused treatments also need to be considered.
- Individual-focused interventions can be effective in reducing CU traits and antisocial behavior in these children.
- However, children with high CU traits typically have worse pre-morbid functioning than their low CU trait peers with antisocial behavior.
- Thus, even if the response of children with high CU traits to treatment is comparable to that seen in children with low CU traits, their post-intervention behavior may still be problematic and they may need longer, more intensive, or personalized interventions.

Areas for future research

- There is a need for further RCT studies of individual-focused treatment of antisocial behavior in children with high CU traits
- Interventions that target specific vulnerabilities in these children, including adjuncts that target atypically low response to emotional stimuli, should be a focus of research

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