

REVIEW

COMPREHENSIVE REVIEW OF CURRENT FINDINGS OF CALLOUS AND UNEMOTIONAL TRAITS.

Satomi Yoshida, Nobuya Takayanagi, Masaki Adachi, Sayura Yasuda, and Kazuhiko Nakamura

Abstract Although conduct disorder (CD) is one of the most common mental health problems among children and adolescents, it still has a very heterogeneous diagnosis regarding its severity, course and presumed aetiology. Callous and unemotional (CU) traits has been focused as a specifier to designate a more severe and chronic subtype of CD. Studies regarding CU traits among children and adolescents have been conducted from multiple perspectives such as genetic, cognitive, emotional, biological and clinical. In addition, several reviews have offered comprehensive information about CU traits. However, most of those reviews focused not only on CU traits but also on psychopathic traits, mainly because the concept of CU traits was established relatively recently. There is no review of studies held in Japan. The aim of the current review is to offer comprehensive information about CU traits from relatively new studies which have investigated not psychopathy but exact CU traits. This review will also describe the Japanese studies of CU traits.

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Introduction

Conduct disorder (CD) is defined as a repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated¹⁾. A meta-analysis reported that the worldwide prevalence of CD was 3.2%²⁾, and Sugawara et al.³⁾ reported that the prevalence of CD in Japan was 3.5%. It is also reported that CD is highly related to criminal behaviour and social exclusion, at great cost to both the individual and society^{4, 5)}. Although it is clear that CD is one of the most important psychiatric disorders among children and adolescents, it still has a very heterogeneous diagnosis regarding its severity, course and presumed aetiology⁶⁾. To clarify the subtypes of CD, it is imperative to reveal its aetiology, predict its prognosis and develop appropriate interventions. A

number of previous studies have tried to clarify the subtypes of CD, including the American Psychiatric Association's Diagnosis and Statistical Manual of Mental Disorders (DSM)¹⁾.

On the other hand, since Cleckley⁷⁾ provided an original concept of psychopathy, a large body of research has been conducted to improve its validity and usefulness in both its research and clinical aspects. Psychopathic personalities, characterized by egocentricity, absence of emotions, absence of anxiety and absence of lasting relationships⁷⁾, were originally investigated among adult samples, and research showed that such personalities are clearly related to antisocial behaviour⁸⁾. In addition, some research has applied the concept of psychopathic traits to children and adolescent samples, especially in terms of conduct disorders/problems and conducted studies from multiple perspectives such as

genetic, cognitive, emotional, biological and clinical (prediction of prognosis and reaction to treatment). Those efforts have suggested that the callous and unemotional (CU) traits, which correspond to the affective dimension of psychopathy, are among the most promising concepts to distinguish a certain subtype of CD among children and adolescents⁹. CU traits are characterized as a lack of empathy and guilt, shallow and deficient emotions and failure to put forth the effort on important tasks¹⁰; they are also applied as a specifier for CD in the latest DSM-5, although the term “with limited prosocial emotions” is used in DSM-5 because of a concern about the nature of the term of “callous and unemotional” as a potential stigma¹¹.

Previous reviews offered comprehensive summaries about CU traits among children and adolescents; however, most of those reviews focused not only on CU traits but also on psychopathic traits. This was mainly because the concept of CU traits was established relatively recently, and there is no review which describes studies held in Japan^{9, 11, 12}. The aim of the current review is to offer comprehensive information about CU traits from relatively new studies which have investigated not psychopathy but exact CU traits. It will also describe Japanese studies of CU traits.

CU traits as a clue to reveal the aetiology of conduct disorder

a) Genetic research

Many studies have investigated the relationship between genes and behavioural problems¹³. Recently, some reports have started to investigate the behavioural genetic aspects of CU traits. Frick *et al.*⁹ reviewed previous studies of the genetic aspects of CU traits, noting that the heritability of CU traits accounted for by genetic effects was estimated to be from 42% to 68%. Frick's group stated

that a large part of the relationships between CU traits and conduct problems has been reported to be due to shared genetic effects but little effect has been identified as emerging from a shared environment. A pioneering study conducted by Vinding *et al.*¹⁴ used twin methodology and examined CU traits and antisocial behaviour as rated by teachers among 3,687 twin pairs, 7 years old. Their striking results showed that two-thirds of the difference between the children with high levels of CU traits and the population can be explained by genetics. They also reported that the high heritability of antisocial behaviour among children with CU traits was not mediated by mean levels of antisocial behaviour; in other words, it was more likely to be mediated by the CU traits¹⁴. Vinding *et al.*¹⁵ followed up on this study, examining the twins at the age of 9, and replicated their previous findings, showing that the magnitude of heritability of antisocial behaviour among children with CU traits became greater when the influence of hyperactivity was excluded¹⁵.

Such findings from behavioural genetic studies suggest that genetic research on antisocial behaviours should focus on CU traits and, in fact, more recently, some molecular genetic studies have focused on CU traits among antisocial children or adolescents. The serotonin system is regarded as having an effect on CU traits^{13, 16}. For example, Moul *et al.*¹⁷ examined the genotype of a single nucleotide polymorphism from the promoter region of the serotonin 1B receptor gene (HTR1B) and the methylation levels of 30 CpG sites from 3 CpG regions surrounding the location of this polymorphism among 117 boys with antisocial behaviour, aged 3-16. They showed an association with lower levels of HTR1B gene methylation and higher levels of CU traits, which was also mediated by the genotype of rs11568817 and methylation levels at CpG sites 12 and 14. From

those complicated results, they suggested a hypothesis that the presence of the minor allele at rs11568817 might be a risk factor for high CU traits. In addition, the methylation of CpG sites 12 and 14 decreases the transcription factor binding to this site and reduces the risk for high CU traits. On the other hand, Beitchman et al.¹⁸⁾ examined the oxytocin receptor gene (OXTR), which was reported to be associated with human affiliative behaviour and emotional regulation and stability¹⁹⁾, among 162 children aged 6-16. Their results showed an association between the levels of CU traits and the genotype of the OXTR_rs237885 among children with aggressive behaviour. The exact role of those genes' influence on CU traits should be investigated in future studies, because identifying the association between genes and CU traits would improve the aetiological understanding of CU traits and CD.

b) Research into cognitive and emotional characteristics

Previous studies have produced some consistent findings in cognitive and emotional characteristics among children and adolescents with CU traits. First, the impairment of recognising cues of fear and sadness in others, otherwise known as being deficient of empathy, a core characteristic of CU traits, was constantly reported^{20, 21)}. Previous studies showed that children and adolescents with psychopathic traits can show cognitive empathy: the difference between knowing the "how" and "why" of other people's feelings. However, they are not able to express affective empathy: "feeling" the emotions of another person^{22, 23)}. The relatively new report from Munoz et al.²⁴⁾ seems to support such results. They investigated 201 children (aged 11-12 years) about their CU traits, bullying and empathy, and reported that the high CU group showed significantly lower levels of affective empathy

than other groups. However, no significant differences were found among them in terms of cognitive empathy. Another interesting study is Jones et al.²⁵⁾, who compared boys with conduct problems and CU traits, boys with autism spectrum disorder and normal boys. They found that CU traits influence affective empathy, but not cognitive empathy, as measured by Theory of Mind tasks. On the other hand, participants with autism spectrum disorder showed difficulty in tasks of cognitive empathy, but they reported victim empathy in line with the comparison group. These results suggested that children and adolescents with high CU traits are able to recognise other people's distress, but they do not care about it.

Second, abnormal reactions to punishment cues of children and adolescents with CU traits were reported^{26, 27)}. For example, Frick et al.²⁶⁾ investigated 98 children with and without CU traits to examine whether the level of CU traits would influence a lack of behavioural inhibition regarding cues to punishment. Their results showed that children with high levels of CU traits showed a decrease of sensitivity to cues to punishment once a reward-oriented response set was formed, and the result was constant, regardless of the presence of conduct problems.

Third, previous studies have shown that children and adolescents with high levels of CU traits and conduct problems tend to have unique social-cognitive processes such as approving more deviant values and goals in social situations. Pardini et al.²⁸⁾ compared diagnosed youth with and without high levels of CU traits in terms of their ideas regarding results of aggressive behaviour. They reported that higher CU traits were associated with increased expectations and values of positive consequences of aggression such as tangible rewards and dominance and decreased expectations and values of negative consequences of deviant behaviour such as

punishment. Interestingly, those results were constant even after controlling for the influences of the history of abuse, intellectual abilities and severity of delinquency. In addition, it was reported that diagnosed juveniles with high CU traits were more likely to approve of negative social goals such as revenge and dominance when they faced minor peer provocation, and they tended to ignore a victim's suffering even though they seemed to be able to judge whether their aggression caused the victim to suffer²⁹⁾.

c) Biological markers

Some biological markers seem to be associated with cognitive and emotional characteristics of children and adolescents with CU traits. For example, blunted biological reactivity to certain types of stimuli is a constant result reported by previous studies. De Wied *et al.*³⁰⁾ investigated youths with conduct disorder and CU traits and youths with only conduct disorder, reporting that the magnitude of heart rate change when viewing emotionally evocative films was significantly lower among youths with conduct disorder and CU traits than youths with only conduct disorder. In addition, children with high levels of CU traits showed a lower level of salivary cortisol after an experimental standardized stress test³¹⁾.

Further, the number of studies reporting structural and functional brain abnormalities of children and adolescents with high levels of CU traits has increased recently. For example, Fairchild *et al.*³²⁾ reported that the volume in the caudate nucleus and the ventral striatum and the levels of CU traits were significantly correlated positively among male adolescents with conduct disorder, even after their symptoms of conduct disorder were controlled. In addition, two current studies investigated cortical abnormalities among children with CD and CU traits^{33, 34)} and reported a significant

relationship between the level of CU traits and thickness of the right temporal and lingual gyrus cortex. The amygdala seems to have a characteristic function among children and adolescents with high levels of CU traits compared to normative children and adolescents³⁵⁻³⁷⁾. For example, children with high CU traits and conduct disorder showed lower amygdala response to fearful facial expressions relative to typically developed children^{35, 36)}. In addition, amygdala activity to preattentively presented fear was different significantly depending on the levels of CU traits among children with conduct disorder, and high levels of CU traits were significantly associated with lower amygdala activity³⁷⁾. It should be noted that those results showing a significant relationship between the CU traits and functional or structural brain abnormality were not always confirmed, mainly because it is quite recently that brain imaging studies have been applied to children and adolescents with CU traits;³⁸⁾ in addition, the differences among research target areas in the brain make it difficult to integrate previous findings. However, considering the relatively consistent findings from brain imaging studies of adults with psychopathy—which have reported structural and functional abnormalities in the limbic and prefrontal regions that involve the functions of emotion recognition, decision making, morality and empathy—the lack of consistent trends in youth about association between the CU traits and brain abnormality might reflect the fact that the young brain is still in the developmental process.

Saitou and Harada³⁹⁾ and Saitou and Aoki⁴⁰⁾ suggest the concepts of the 'Disruptive Behaviour Disorder (DBD) March' which depict possible pathways of attention-deficit/hyperactivity disorder (ADHD) to DBD including CD (Fig. 1). Based on a previous finding that 40% of elementary school students with ADHD were

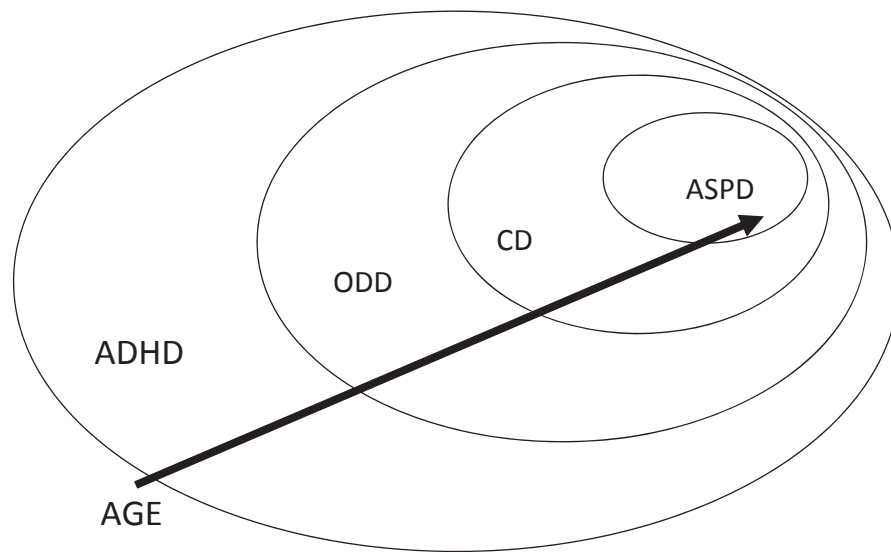


Fig. 1 Disruptive Behaviour Disorder March (Saitou and Harada, Saitou and Aoki)
The concept of Disruptive Behaviour Disorder (DBD) March depicts a possible pathway of ADHD to DBD including CD.

diagnosed with oppositional defiant disorder (ODD), and 30% of them presented with conduct disorder (CD) around the adolescence period⁴¹⁾, Saitou and Harada³⁹⁾ described that, as children grow up, some children with ADHD would follow a certain pathway from ADHD to CD, and some of them would show antisocial personality disorder (APD) in adulthood. However, to summarize CU traits as a cue to reveal the aetiology of conduct disorder from the current review, another possible aetiology of severe conduct problems exists as related to CU traits (Fig. 2). That is to say, individuals with high levels of CU traits show a blunted reactivity to certain types of stimuli such as fear and sadness because of functional and structural brain abnormalities, possibly based on genetic influences. Those blunted biological reactions influence cognitive and emotional abnormalities in social situations, potentially interfering with opportunities to develop normal emotional and cognitive function and leading to severe conduct problems. The pathway from biological influence (e.g., genetic influence biological reactivity) to behaviour abnormality

(severe conduct problems) via cognitive and emotional characteristics seems to be similar to the pathway of autism spectrum disorder (ASD); this similarity may imply the possibility to establish more early detection of CD. Earlier and more efficient intervention for children with severe CD as the many useful methods of early detection and intervention for ASD that have been established. Although the aetiology seems to be complicated, many studies have tried to reveal this hypothetical pathway, thus increasing attention to the role that CU traits play in severe conduct disorder.

Clinical utility of CU traits

To date, some cross-sectional and longitudinal studies have noted the association between the level of CU traits and outcomes such as conduct problems, delinquency, aggression and criminal offending in clinical, forensic and community samples. Some cross-sectional studies (e.g., studies from Howard et al.⁴²⁾ and Kunimatsu et al.⁴³⁾) have reported that CU traits were associated with some types

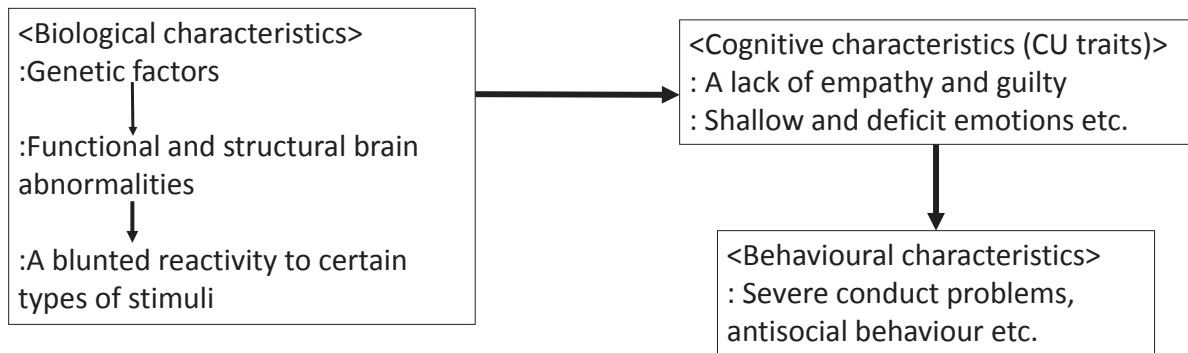


Fig. 2 A possible aetiology of severe conduct problems relating to CU traits
This is another possible pathway of severe CD. Biological characteristics might cause the abnormalities of cognitive characteristics which might cause behavioural problem such as severe conduct problems and antisocial behaviour.

of delinquency such as violence, property damage and drugs among detained juveniles. In addition, longitudinal studies support the results from the aforementioned cross-sectional studies. Kahn *et al.*⁴⁴⁾ examined 417 male youths who showed high rates of behaviour problems when they were in the first grade and who have participated in a longitudinal study. The researchers assessed the level of their participants' CU traits in their early adulthood and followed their criminal official records for about 3.5 years. They found that CU traits were robustly associated with future offending, even after other risk factors such as prior offending, substance use and employment status were controlled.

Furthermore, not only in clinical and forensic samples but also in community samples, the relationships between CU traits and conduct problems were reported. One such study which investigated a large number of samples was held in the UK⁴⁵⁾ and investigated DSM-IV diagnoses of psychiatric disorders and levels of CU traits among 7,977 children, including 5,326 children who were followed up for 3 years. Researchers found that the prevalence of DSM-IV CD was 2% among the samples and 46.1% of children with CD had high levels of CU traits. In addition, children with CD and high CU traits

showed more severe behaviour problems and were at higher risk of being diagnosed as CD 3 years later. In addition, more common problems in children such as aggression and bullying were also reported as significantly associated with the level of CU traits^{46, 47)}. More recently, Longman *et al.*¹¹⁾ implemented a meta-analysis of studies investigating the relationship between CU traits and antisocial behaviour in early childhood. Ten studies comprising 5,731 participants found a significant relationship between CU traits and conduct problem severity in the order of large effect size ($r=.39$, $p<.001$).

Response to interventions is also an important aspect as a prognosis, and some studies have examined the influence of CU traits on the outcome of intervention for conduct problems. For example, Manders *et al.*⁴⁸⁾, White *et al.*⁴⁹⁾ and Masi *et al.*⁵⁰⁾ reported the negative influence of CU traits on their interventions such as multisystemic therapy, functional family therapy and multimodal psychosocial intervention for clinical and forensic samples. They also reported that the youth with high levels of CU traits showed poorer outcomes than those with normal levels of CU traits. On the other hand, Dadds *et al.*⁵¹⁾ reported high levels of CU traits as a good predictor of intervention. They conducted a randomized control trial to test the efficacy

of emotion recognition training (ERT) in a complex sample of children with some types of mental problems including conduct disorder. Their results showed that ERT had little impact on the severity of conduct problems overall. However, children with high levels of CU traits showed significant improvement regardless of their types of mental problems. Although it was noted that those children still had clinical levels of conduct problems after ERT, their findings are important as a footing to develop efficient intervention for children and adolescents with conduct problems and high CU traits.

Such findings show the utility of CU traits as a predictor of the severity of conduct problems among children and adolescents, an outcome useful not only in clinical settings but also in social communities such as school because the levels of CU traits seem to be related to common behaviour problems such as bullying, as well as more severe antisocial behaviour including criminal offending.

Issues

Although a lot of attention has been paid to CU traits with an increasing number of studies examining the topic, some issues remain to be noted.

First, it is necessary to consider the influence of the term “callous and unemotional traits” as a stigmatization. The current review could not find any study reporting the stigmatization of “callous and unemotional traits”; however, some reports investigated the labelling effect of psychopathy on the court system. Those results were contradicted as described below. For example, Murrie et al.⁵²⁾ examined 326 members of the National Council of Juvenile and Family Court Judges in the United States and found that participants did not show any adverse reaction (e.g., giving more severe sentences) to psychopathy when they decided sentences;

on the contrary, they tended to recommend psychological treatment for juvenile criminals with psychopathic traits. On the other hand, Blais et al.⁵³⁾ evaluated how jurors’ decisions were influenced by the label of psychopathy in Canadian samples. Their results showed that the participating jurors tended to give guilty verdicts and a higher rating of risk for future recidivism even after controlling for defendants’ age and gender. One possible hypothesis from those results is that people from the community (such as jurors) tend to be more affected by the label of **psychopath** than specialists such as judges. One reason why CU traits were developed was the concern that the term **psychopath** is so stigmatic for young people; therefore, hopefully, the term of CU traits would have a less harmful influence, not only on the judicial system but also within a general context. However, the hypothesis that people from a community tend to be affected by the labelling of CU traits should be evaluated in the future in Japan as well because Japan also has a jury system involving people from the community.

Furthermore, to date, some types of measures for assessing CU traits have been used and their reliability should be ensured. The review found 50 studies regarding CU traits among children and adolescents that were published after 2014 and used some databases including MEDLINE, PsycINFO and Embase. Although questionnaires appear to be among the most common measurements to assess the CU traits, the types of questionnaires used in those studies varied. In total, eight types of measures were found. Commonly used ones included the Antisocial Process Screening Device (APSD)⁵⁴⁾ (the number of studies using this device: n=9), the Inventory of Callous and Unemotional traits (ICU)⁵⁵⁾ (n=22), the Youth Psychopathic Traits Inventory⁵⁶⁾ (n=7) and an original measure established by Viding et al.¹⁴⁾ (n=8). The

concept of CU traits was originally developed from adult psychopathy, and this may be one of the reasons that some research used APSD⁵⁴⁾ to evaluate CU traits. However, APSD assesses three dimensions of psychopathy, and the number of items regarding CU subscales is only six, rated on a three-point scale; in addition, all items are negatively worded. On the other hand, the Inventory of Callous and Unemotional Traits (ICU)⁵⁵⁾ was developed based on four items loading consistently on the CU scale of the APSD to complement the defects of APSD to assess CU traits among children and adolescents. In the ICU, positively and negatively worded questions are adopted and each item is rated on a point scale from zero to three. We found the greatest use of ICU among those studies published after 2014—this suggests that many researchers take the utility of ICU into account. The Youth Psychopathic Traits Inventory⁵⁶⁾ is a self-reporting device which has 50 items to evaluate personality traits associated with adult psychopathy in juvenile community samples. Similar to APSD, YPI does not evaluate exact CU traits but, instead, psychopathic traits. Furthermore, Vinding *et al.*¹⁴⁾ established a novel measurement: a combination of three items regarding CU traits from APSD and four items regarding prosocial traits from the Strength and Difficulties Questionnaire (SDQ). This has been used widely in succeeding studies, probably because of its convenience in using the SDQ, which is commonly used in many studies about children's and adolescents' mental health. Although the reliability of all of those measures has been repeatedly reported, we could not find a study which evaluates the correlation between those measurements. It is important to compare characteristics of those measurements to integrate results from studies which use different measures to assess CU traits and to establish more reliable measurements.

Finally, as more understanding of CU

traits among children and adolescents is being established, it is important to investigate possible environmental factors influencing CU traits and intervention for child adolescents with high levels of CU traits and conduct problems. To date, although some research reported that a large part of the relationships between CU traits and conduct problems was due to shared genetic effects, it was also reported that little effect on CU traits has been identified as emerging from a shared environment⁹⁾ such as parenting style and negative life events. For example, Sharf *et al.*⁵⁷⁾ examined 238 incarcerated boys in terms of the level of CU traits, the number of previous negative life events and symptoms of posttraumatic stress disorder (PTSD). Their results showed significant positive associations between the number of negative life events experienced and the level of CU traits, and significant positive associations between the level of PTSD symptoms such as arousal and avoidance and the level of CU traits. In addition, Pasalich *et al.*⁵⁸⁾ examined the association of a parent's emotion socialization style and the level of their child's CU trait. Parents' emotion socialization, which consists of parents' thoughts and feelings about their own and their children's anger and sadness, was measured in self-reported or researcher observation. The findings showed statistically significant association between lower levels of mothers' acceptance of emotions and higher levels of their children's CU traits, although there was no association between fathers' emotion socialization styles and their children's CU traits.⁵⁸⁾ In terms of intervention for children and adolescents with CU traits, studies constantly reported poor outcomes of interventions for children and adolescents with conduct disorder/problems and high levels of CU traits;⁹⁾ however, as mentioned above, Dadds *et al.*⁵¹⁾ reported high levels of CU traits as a good predictor of emotion recognition training (ERT). The number of studies

reporting positive outcomes of intervention for children and adolescents with CU traits is still few, and future studies should focus on establishing efficient intervention for them. At the same time, studies which investigate possible environmental factors influencing the level of CU traits are also desired because they could facilitate the development of efficient interventions for children and adolescents with high levels of CU traits.

Research regarding CU traits in Japan

Although there are some studies which focused on psychopathic traits among Japanese youth, the current review could find no published study which investigated CU traits among Japanese children and adolescents. However, a study of CU traits among Japanese community samples which was measured by a Japanese version of the ICU is in press (Osada). The development of a standardized measure of CU traits in Japan would increase the number of studies investigating CU traits in Japanese samples.

Conclusion

In line with previous studies, findings across multiple studies including genetic, cognitive, emotional and clinical aspects showed that the concept of CU traits plays an important role as a cue to reveal the aetiology of conduct disorder and functions as a reliable predictor of severe conduct disorder/problems. Focusing on CU traits among children and adolescents with conduct disorder/problems might help to identify the more severe groups among them, leading to more appropriate treatment. This is important not only in a medical context but also in the context of public policy, because youth with CU traits might be seen in juvenile court systems as well. Although the utility

of CU traits seems to be established, some issues remain, such as stigmatization and measurements. Further research tackling these issues should be conducted. In addition, research about CU traits has not yet flourished in Japan but it is hoped that more attention to CU traits should be paid in the research and clinical areas in Japan.

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