

Callous and Unemotional (CU) Traits

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Contributor: Myriam Squillaci

Behavioral disorders (BD), including disruptive, aggressive, and/or antisocial behavior, are some of the most common disorders in children and adolescents. The notion of BD used in our review is an umbrella term, including children and adolescents with a range of emotional and behavioral disorders. It includes a population with heterogeneous behavioral diagnoses such as oppositional defiant disorder (ODD), conduct disorder (CD), internalized disorders (ID), conditions often associated with aggressive and/or antisocial behavior. Retrospective research in the field notes heterogeneous developmental trajectories that could be explained by certain risk factors, including the severity of callous-unemotional (CU) traits, a constellation of emotional and personality traits in children considered as a precursor to adult psychopathy.

Keywords: callous-unemotional traits ; childhood ; functioning ; review

1. Introduction

Behavioral disorders (BD), including disruptive, aggressive, and/or antisocial behavior, are some of the most common disorders in children and adolescents ^[1]. The notion of BD used in our review is an umbrella term, including children and adolescents with a range of emotional and behavioral disorders. It includes a population with heterogeneous behavioral diagnoses such as oppositional defiant disorder (ODD), conduct disorder (CD), internalized disorders (ID), conditions often associated with aggressive and/or antisocial behavior ^[2]. These patterns place a very significant burden on the individual as well as on society in general. Numerous studies have shown that youth with DB present an increased risk for developing severe and persistent antisocial behaviors in adulthood, such as being involved in substance abuse, crime, unemployment, and early death ^{[3][4]}. Retrospective research in the field notes heterogeneous developmental trajectories that could be explained by certain risk factors, including the severity of callous-unemotional (CU) traits, a constellation of emotional and personality traits in children considered as a precursor to adult psychopathy ^[5]. Children with CU traits show a behavioral pattern characterized by a lack of empathy and guilt, insensitivity to others' feelings, shallow and deficient affect (e.g., lack of emotion recognition, of perspective-taking), unconcern for performance, and the callous use of others for one's own personal interest ^{[1][6][7][8][9]}.

Despite Frick's pioneering work ^{[10][11][12]}, the issue of CU traits in children and adolescents emerged officially only with the fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) of the American Psychiatric Association ^[1]. Previously limited to the conceptualization of psychopathy in adulthood, these traits now designate a subtype of youth with (a) a severe and recalcitrant form of antisocial behavior and (b) distinct neurological, cognitive, emotional, and social characteristics ^[6] (p. 710). CU traits are constitutive of the "Limited Prosocial Emotions" (LPE) specifier of the conduct disorder ^[1]. This designation has major implications in terms of etiology, development, and intervention and should therefore be considered in the assessment of behavioral disorders, in particular conduct disorder.

The following sections summarize CU traits assessment and these three domains, mostly based on a review of literature reviews on CU traits in children and adolescents. Indeed, research on CU traits in children and adolescents has been particularly flourishing this past decade.

2. CU Traits Assessment

Several instruments exist to measure CU traits in youth (e.g., Youth Psychopathy Traits Inventory; Psychopathy Checklist: Youth Version; Child Problematic Traits Inventory ^[13]). However, a commonly used instrument for assessing CU traits in children and adolescents is the Inventory of Callous-Unemotional Traits (ICU) ^[14]. This scale, which has contributed significantly to the development of the LPE specifier introduced in the DSM-5 ^[15], consists of 24 items divided into three dimensions (callous, uncaring, and unemotional). Responses are scored on a 4-point Likert scale, ranging from 0 (not at all) to 3 (definitely true) ^[15]. As CU traits assessment requires multiple informants (the child himself, his caregivers, and/or teachers ^[1]), self-report and other reports of the ICU exist. Psychometric properties of the ICU such as factorial structure and internal consistency have been explored by, among others, Kimonis et al. ^[16] in the USA, Essau et al. ^[17] in Germany,

Ciucci et al. [18] in Italy, Roose et al. [19] in the Netherlands, Pechorro et al. [20] in Portugal [20] and Ezpeleta et al. [21] in Spain. To our knowledge, to date no version of the ICU scale has been translated and validated in French-speaking language, despite Garcia et al. [13] announce of actual work on French validation of CU traits' scales. Several validation studies have shown certain robustness of its three-dimensional structure regardless of language, age, sex, and evaluators, even if fit indices seem to be modest and reach acceptable fit with post hoc modification to the model [6] (p. 714), which is known to be questionable [22]. The recent meta-analysis by Cardinale and Marsh [15] reports good internal consistency and strong convergent and external validity for all scores on the ICU scale and the callous and uncaring subscales, but not for the unemotional scores [15], as previously noted by Kimonis et al. [16]. Findings available to date support the usefulness of this scale, mainly at the total score level [23]. Strong relations with variables linked to antisocial behavior have been established by several studies, e.g., [6][24].

3. Etiology

Recent research shows that children and adolescents with CU traits present specific genetic, cognitive, emotional, biological, and environmental characteristics, some of which being similar to those of adults with psychopathy [25][26]. This implies that the etiological factors underlying their behavioral problems are different from other young people with severe BD [24]. Both individual (e.g., genetic, neurobiological) and environmental risk factors contribute to the risk of developing psychopathic traits [26][27][28][29]. In this respect, the difficulty of isolating purely endogenous risk factors can be noted since they are in constant interaction with environmental factors (i.e., passive/evocative gene-environment correlation phenomenon (rGE), e.g., [26]). Nevertheless, the following is an attempt at a taxonomic presentation intended to provide a better understanding of the origin and effects of CU traits on youth functioning.

3.1. Genetic Risk Factors

Despite possible neurocognitive vulnerabilities that enhance susceptibility to develop psychopathic features, Viding and McCrory [26] have clearly stated that to date, there are no genes identified as being linked to the development of psychopathy. Thus, although an individual's genome probably limits a range for phenotypic expression, it does not specify in advance how an individual will evolve, as development is strongly influenced by environmental factors [26][28] (p. 569). If there is currently insufficient evidence to question specific genetic mechanisms, the review conducted by Moore et al. [30] indicates an estimated 36% to 67% heredity of CU traits. To date, heredity is thought to influence primarily disruptive behaviors with high levels of CU traits, whereas environmental factors are thought to have a greater impact on disruptive behaviors with low levels of CU traits [26]. In this regard, research results, including twin samples, indicate that the stability of CU/psychopathy traits is largely determined by genetic influences [26].

3.2. Emotional and Cognitive Risk Factors

The "Limited Prosocial Emotions" specifier states that children and adolescents with CU traits have an emotional deficit without indicating which particular deficit is involved [31]. Several authors agree that low interpersonal emotional sensitivity and fearlessness play a major role in CU traits, notably their interaction, e.g., [6][32]. These characteristics are further exacerbated by environmental risk factors as harsh parenting practices and lack of parental warmth [32]. Low interpersonal emotional sensitivity would affect the development of emotional empathy from the age of 2 (i.e., diminished facial or verbal expressions of concern for the distress of others, impaired eye contact), e.g., [6][32]. As for fearlessness, it could have an impact on the development of behavioral inhibition in response to both social (e.g., punishment) and non-social (e.g., mentally appropriate frightening stimuli) threats. As a result, children would be less likely to learn to relate fear or other aversive emotions with actions that involve risk, harm, or punishment [32] (p. 14). Thus, these youths would also take greater risks compared to children with behavioral problems without CU traits [31]. In terms of cognitive risk factors, some reviews indicate a negative correlation of intellectual quotient (IQ) and CU traits [31], as well as impaired decision-making and impaired perception of the reward processing [31][33]. These emotional and cognitive characteristics can be explained in part by neurobiological factors.

3.3. Neurobiological Factors

Research using functional (fMRI) and/or structural (sMRI) brain imaging provides a better understanding of the neural mechanisms involved in the etiology of CU traits, although results obtained in children and adolescents are less consistent than in adults [25][34]. Abnormalities in different parts of the brain seemed involved [28], particularly the prefrontal and limbic structures, including the amygdala and striatum [25][34][35]. Those areas are involved in the production of prosocial behavior and in learning the relationship between a behavior and its consequences. Thus, the amygdala plays fundamental roles in recognition of (mostly negative) emotions and in reactions, especially to fear stimuli [25]. For example, findings indicate that compared to typically developing (TD) youth or youth with CD without CU traits, young with CD and high CU traits

would have hypo-reactivity of the amygdala to fear stimuli, partly explaining their proactive, aggressive behaviors. On the contrary, young with CD and low CU traits would show hyper-reactivity of the amygdala to fear stimuli, partly explaining their difficulty in regulating their emotions and their reactive aggressive behaviors when they feel threatened [33]. With respect to the prefrontal cortex, it is involved in many functions such as executive functions (EF), impulsivity, inhibition, sensitivity to punishment and reward, risk-taking, and decision-making (op. cit.). Failing executive functions or disinhibition/impulsivity may also explain how high CU traits lead to more severe forms of antisocial behavior over the life course [36] (p. 14). Research in the field also points out that youth with BD would present different brain functioning according to their level of CU traits and would therefore have distinct neurocognitive vulnerabilities [33].

Functional (and possibly structural) impairments at these levels could be associated with antisocial, callous and unemotional behavior, and adult psychopathic traits could have juvenile origins (i.e., similar deficits are observed in adult neuroimaging research [25]). However, a causal model cannot be deduced from this without risking stigmatizing children and adolescents who are still developing [25]. Thus, while functional brain deficits may contribute to a better understanding of the etiology of antisocial behavior and CU traits in children and adolescents, they should be considered as part of a constellation of both endogenous and exogenous risk factors and from a biopsychosocial perspective (person-by-context interactions).

3.4. Environmental Risk Factors

Numerous studies examined the influence of the context in the development of young with CU traits, including parental attachment quality, parental practices and interactions, parental socioeconomic status, or other life experiences such as teachers or peer relationships, e.g., [15][32][37]. For example, it has been shown how certain parenting practices, such as high levels of positive reinforcement from adoptive mothers, buffer the effects of hereditary risk for CU behaviors [38][39]. Although parenting is thus likely to be a direct, non-hereditary influence on the development of CU behavior, it interacts with aspects of children's temperament to exacerbate or buffer the risk of CU behavior [29] (p. 123). A better understanding of the causal patterns of these children and adolescents allows for more targeted prevention [28] in order to develop certain social skills, such as empathy or emotional regulation [40], if possible, before serious disruptive behavioral problems emerge [24][41].

4. Development

Several studies have examined the influence of CU traits on one or another aspect of development, particularly on social functioning. Results have shown that, in this highly antisocial context of the sample, high levels of CU traits are significantly related to minimizing the consequences of aggression and empathy toward others. For example, it was found that young people who use forms of emotional or physical violence against a parent (child-to-parent aggression) at an early age (10 and 11 years) are more likely to have CU traits [42]. Again, some authors have found differences according to the level of CU traits. For instance, according to the model of Quay et al. [43], adolescents with low levels of CU traits would perpetrate aggression toward their parents primarily in response to harsh parenting practices (revenge goal), while youth with high levels of CU traits would commit these acts more broadly, both toward their parents and extra-family members (i.e., peers, siblings) and rather for personal gain and dominance. CU traits are also reported to be significantly and positively associated with the perpetration of bullying at school [44][45]. Similarly, while young offenders with CU traits do not appear to be influenced by the delinquent behavior of their peers, their delinquent behavior tends to strongly influence the delinquent behavior of their friends [46]. In addition, high levels of psychopathic traits, low levels of empathy, and emotional intelligence are potential risk factors for gang membership. However, contradictory research findings prevent conclusions from being drawn regarding the influence of psychopathy and CU traits on gang membership [47].

At first glance, one might think that CU traits only influence people's social functioning (e.g., social relationships and emotional regulation). Meanwhile, research findings in the field show the influence of these traits on other developmental domains, such as health, cognition, and context. With regard to health, it was broadly noted that CU traits are associated with lower levels of neuroticism (e.g., anxiety, fear, guilt, depression) [24]. To obtain a better understanding of the heterogeneity of conduct disorders (CD), Fanti [48] focused on the role of different physiological systems. In particular, this review showed that the dysfunctional activity of facial electromyography, which is related to reduced empathy, was more evident in the group of young people with conduct disorder and CU traits than in other subgroups (e.g., with internalized disorders). In addition, the serotonin and oxytocin systems may also play a role in the characteristics of CU traits [30]. Young with CU traits are also reported to have low levels of cortisol [35]. Low cortisol levels are generally associated with aggressive behaviors, particularly when these are early or proactive. In contrast to adults with psychopathy, high testosterone levels have so far not been demonstrated in young people. However, higher levels of dehydroepiandrosterone, a testosterone precursor, have been found in young people with antisocial behavior [35].

Regarding cognition, studies have looked at the link between reactive aggression, typical of youth with low levels of CU traits, and deficits in social information processing, impacting decision-making. Young people with such deficits in social information processing would be unable to provide appropriate responses in social situations, leading them to respond with aggressive behavior. These children would therefore treat social information differently from their non-aggressive peers ^[43]. Young people with high levels of CU traits would also show deficits in social information processing (SIP), related to a type of proactive aggression. In this case, the use of aggression would be more a reasoned choice than the result of a lack of anger control, particularly with the aim of dominating others ^[43]. Dysfunctions in terms of moral judgments (perspective-taking, SIP) and emotional reactivity thereby confer a risk of aggression throughout adolescence and into adulthood ^[49].

As explained in the etiology section, person-by-context interactions play a role in the development of CU behaviors, including interactions between child temperament and parenting practices ^[36]. For example, inconsistent, cold, and harsh parenting practices have been shown to be involved in the development and even the maintaining of CU traits ^[31]. However, a child with CU traits is also more likely to elicit negative parental responses and to provide parents with fewer opportunities for compliments or rewards, increasing the likelihood that the pattern of parent-child interaction becomes largely negative ^[26]. However, studies have shown that parenting behavior may mitigate or exacerbate certain child traits such as fearlessness or even certain genetic characteristics, which themselves are associated with the risk of developing CU behaviors ^{[36][39]}.

In light of the above, it is not surprising that some authors such as Waschbusch et al. ^{[5][50]} or Frick and Ray ^[6] argue that CD children with high levels of CU traits have a different developmental pathway than CD children without these traits. Characteristics associated with CU traits, different from TD children or children with CD without CU traits, are thought to appear early in development ^[6]. Early childhood studies report that CU behaviors observed at the age of three are correlated with deficits in empathy, guilt, and awareness ^[51]. They predict later aggression, concurrent and future behavioral problems, and lower social acceptance by peers ^{[29][52]}. At risk for chronic BD during childhood ^[36], children and adolescents with CU traits appear to be at risk for more severe and persistent antisocial consequences ^{[13][24]}, even taking into account the severity of their conduct problems, the age of onset of these problems and common comorbidity problems (e.g., attention deficit disorder with or without hyperactivity (ADHD), anxiety disorders) ^[53]. CU traits represent a significant risk factor for entering future trajectories of antisocial and aggressive behavior ^[54] or even developing an antisocial personality disorder or delinquent or even criminal behavior in adulthood ^{[13][55]}.

In addition, CU traits are reported to be stable over time ^[51], both from early childhood to late childhood ^[54] and from childhood to adolescence ^[24]. However, half of the studies reviewed by Wilkinson et al. ^[56] show that young people with CU traits may respond positively to some interventions. This means that CU traits, such as any personality trait or other psychopathology, are not fixed: they may decrease following certain interventions (see also ^{[28][37]}). Thus, although the developmental trajectory of these children and adolescents differs from that of young people without CU traits, it is no less heterogeneous (principle of equifinality, e.g., ^{[24][28]}).

5. Intervention

Research has shown that children and adolescents with both severe behavior problems and high CU traits tend to respond less positively to standard interventions ^[57]. In particular, they are reported to be insensitive to punishment ^[6]. Nevertheless, they are reported to show positive responses to some intensive interventions tailored to their unique emotional and cognitive characteristics ^[53]. The review by Lui et al. ^[9] has indeed highlighted the interest of interventions in emotion recognition and perspective-taking for adolescents with BD, although young people with antisocial behaviors were poorly represented in the studies reviewed. Most programs targeting the development of perspective skills show positive outcomes, which is also promising for young people with CU traits to work on their emotional skills ^[9]. These results are thus in line with the recommendations of Baker et al. ^[33] to intervene intensively in developing sensitivity to other people's distress cues, improving prediction errors, and identifying expected value signals when making decisions.

Still, according to Baker et al. ^[33], youth with low levels of CU traits are likely to respond to interventions that focus on improving the management of emotions, particularly anger. Thus, computer-based emotion recognition training programs ^[58] or programs that address deficits in reciprocal eye contact that can modify emotional engagement and, therefore, the quality of relationships between children and their parents seem promising, although their effectiveness remains to be demonstrated ^[57]. A growing number of studies report the effectiveness of certain intervention programs, including multimodal and comprehensive approaches that combine CBT, medication, family therapy, parenting interventions, and the development of socio-emotional skills, e.g., ^{[34][51]}. In relation to pharmacological intervention, Pisano et al. ^[51] point

out that no specific treatment exists for CU traits and that while pharmacotherapy can be an interesting added value to psychosocial intervention in disruptive behavior disorders, it would improve aggression and emotional dysregulation, but not CU traits (see also Masi et al., [59]).

In this regard, the value of early intervention in preventing the development of persistent antisocial behavior has been widely noted, e.g., [29][57] particularly because early childhood, such as the prenatal stage, is a developmental period that is particularly sensitive to environmental influences [24][53][60]. Indeed, during early childhood, experience-dependent neuroplasticity is at its peak [61]. Early intervention can influence both neurodevelopment (e.g., with nutrition, including omega-3 supplementation, e.g., [25][62], or zinc [63]) and biology through psychological processes (e.g., hormone levels are influenced by interactions between parent and children [34][64] (p. 303)). Along the same lines, some research highlight the role of oxytocin, which is recognized as the main moderator of complex social behaviors (e.g., attachment, social recognition, aggression) [35]. Like social support, oxytocin (and particularly their combination) is thought to have a positive effect on stress responsiveness, thereby lowering cortisol levels. As the amygdala appears to be the preferred target of oxytocin, the effects of its administration as a treatment are promising but have still to be investigated [35]. In addition, some youth with high CU traits would also be particularly sensitive to warm parenting practices and would respond positively to parenting interventions [37][57] or positive reinforcement strategies [28][65]. Primary prevention strategies (e.g., positive reinforcement of prosocial behaviors) in preschool also are of particular interest, especially if it is implemented universally so that all children can benefit [28].

These findings demonstrate that CU traits are evolving and remind us of the importance of considering them from both a dynamic developmental perspective and a biopsychosocial approach: "If a child's general antisocial behavior improves following intervention, changes in parental response may follow, which, in turn, could also facilitate reductions in CU traits over time" [56] (p. 560).

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