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Abstract

Cognitive Disengagement Syndrome (CDS), also known as Sluggish Cognitive Tempo (SCT), constitutes a cluster of persistent behavioral patterns or symptoms characterized by attentional disengagement, sluggish information processing, and hypoactivity resulting from neurodevelopmental deficits. This syndrome has progressively attracted attention within Attention-Deficit/Hyperactivity Disorder (ADHD) research and has emerged as a novel independent field of investigation. Empirical studies reveal that the CDS/SCT population exhibits distinct impairment profiles in mind wandering, academic difficulties, internalizing symptoms, and sleep disturbances compared to related disorders such as Attention-Deficit/Hyperactivity Disorder, anxiety disorders, and depressive disorders. Furthermore, CDS-related functional impairments may be associated with abnormalities in the dorsal attention network and default mode network. Accumulating evidence demonstrates that CDS represents an independent psychological disorder. Future research endeavors should not only establish CDS as a distinct disorder, examine the lifespan developmental trajectory of CDS features, and investigate the relationship between its overall structure and sub-dimensions, but also diversify research methodologies for CDS.

Full Text

Characteristics of Cognitive Disengagement Syndrome: A Comparative Analysis with Attention Deficit Hyperactivity Disorder and Other Disorders

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Abstract
Cognitive Disengagement Syndrome (CDS), also known as Sluggish Cognitive Tempo (SCT), constitutes a cluster of persistent behaviors or symptoms arising from neurodevelopmental deficits, involving attentional disengagement, sluggish processing of external information, and hypoactivity. This syndrome has garnered increasing attention within attention deficit hyperactivity disorder (ADHD) research and has emerged as an independent field of study. Research demonstrates that the CDS/SCT population exhibits distinct impairment profiles in mind wandering, academic difficulties, internalizing problems, and sleep issues—features that differentiate it from ADHD, anxiety disorders, depressive disorders, and other related conditions. The functional impairments associated with CDS may be linked to abnormalities in the dorsal attention network and default mode network. Accumulating evidence indicates that CDS represents an independent psychological disorder. Future research should not only establish CDS as a distinct disorder but also examine its developmental trajectory across the lifespan and explore the relationship between its overall structure and subdimensions, while diversifying research methodologies.

Keywords: cognitive disengagement syndrome, cognitive functioning impairment, social functioning impairment, neural mechanisms

Cognitive Disengagement Syndrome (CDS) represents a cluster of neurodevelopmentally-based persistent behaviors or symptoms. Cognitively, it involves attentional disengagement and effortful processing of external environmental information, manifesting as staring difficulties, daydreaming, mental confusion or fogginess, withdrawal, and lethargy. Motorically, it involves hypoactivity, such as underactivity, passive or sedentary behavior, and slow, reduced, or delayed motor movements (Becker, Willcutt, et al., 2023). Initially considered a subtype of Attention Deficit Hyperactivity Disorder (ADHD) (Todd et al., 2004), it was widely known as Sluggish Cognitive Tempo (SCT). With deepening research, evidence suggests that it likely constitutes a distinct yet somewhat related psychological disorder separate from ADHD (Barkley, 2014). Research on this condition has flourished in recent years, though slow cognitive processing or tempo does not serve as a defining characteristic of SCT (Becker, Willcutt, et al., 2023). Moreover, the term SCT carries negative connotations (Becker, Fredrick, et al., 2022; Saxbe & Barkley, 2014), necessitating a more descriptive and acceptable terminology. Consequently, Becker and Willcutt et al. (2023) established an international SCT working group, which after multiple deliberations, ultimately selected Cognitive Disengagement Syndrome (CDS) as the new term. Therefore, this paper refers to the condition as SCT, CDS, or CDS/SCT according to the terminology used in cited literature.

In recent years, CDS/SCT research has proliferated internationally, encompassing assessment tool development, cognitive functioning impairments, social functioning impairments, neural mechanisms, and intervention methods. Converging evidence indicates that CDS correlates with internalizing symptoms such

as depression and anxiety, social withdrawal, learning difficulties, and autistic traits (Fredrick & Becker, 2023a, 2023b; Mayes, Calhoun, et al., 2023; Tahıllıoğlu et al., 2023). Increasing evidence suggests that CDS differs from ADHD symptoms and other mental disorders, while simultaneously showing transdiagnostic overlap with multiple psychological conditions (Becker, 2025). Although most CDS research has focused on children with ADHD, studies demonstrate associations between CDS and conditions such as depression and autism spectrum disorder. As a novel psychological disorder, the unique characteristics that distinguish CDS from other conditions remain unclear. This paper systematically reviews relevant domestic and international research, comparing cognitive functioning impairments, social functioning impairments, and neural mechanisms between CDS and related disorders including ADHD, depression, and autism, to reveal the impairment profile of CDS and consolidate evidence supporting its classification as an independent disorder.

Recently, Becker (2025) comprehensively articulated the development of CDS research and its measurement, proposing ten future research directions including the lifespan developmental course of CDS, mechanisms linking CDS to functional outcomes and impairments, and collection of normative data, while discussing the conceptualization of CDS as a unique disorder, diagnostic indicator, or transdiagnostic dimension. However, Becker (2025) did not provide detailed commentary on cognitive functioning in CDS (only summarizing research on processing speed), nor address neural mechanism studies, and failed to systematically differentiate the unique features of CDS relative to other disorders. Therefore, building upon Becker's (2025) theoretical framework, this paper further analyzes the distinctive characteristics of CDS to clarify current consensus and controversies.

1. Characteristic Cognitive Functioning Impairments in Cognitive Disengagement Syndrome

Since CDS/SCT gained attention, research on its cognitive functioning impairments has encompassed attentional functions, working memory, mind wandering, and executive functions. Through a review of recent literature, this paper synthesizes a schematic diagram illustrating the characteristic cognitive functioning impairments of CDS relative to other disorders (Figure 1 [Figure 1: see original paper]).

1.1 Attentional Functions

Researchers have employed the Attention Network Test (ANT) to investigate attentional functioning in CDS/SCT across different disorders, though findings remain inconsistent. Some studies have examined only reaction time differences. Skirbekk et al. (2011) studied children with comorbid anxiety and ADHD and children with ADHD alone, finding no association between SCT symptoms and ANT correct reaction times or reaction time variability, while ADHD-HI symp-

toms showed positive correlation with reaction time variability. Camprodon-Rosanas et al. (2020) found, in a school-aged sample using the same paradigm, that SCT correlated only with reaction time variability. Differences in sample types across these studies suggest that ADHD symptoms may mask the manifestation of SCT symptoms.

Further research has explored differences in attention networks among CDS symptoms, ADHD symptoms, and control groups. Kim and Kim (2021) using the ANT-R paradigm found no significant group differences in alerting network efficiency, but lower orienting network efficiency in SCT groups (SCT+ADHD group, SCT group) and lower executive control network efficiency in ADHD groups (SCT+ADHD group, ADHD group). Kim and Lee (2022) similarly found no significant differences between SCT and control groups in alerting or executive control networks, but significantly poorer orienting network performance in the SCT group. However, Camprodon-Rosanas et al. (2020) found no association between SCT symptoms and any attention networks in school-aged children. Krone, Adler et al. (2023), studying adults with ADHD and healthy controls, found SCT symptoms significantly positively correlated with alerting reaction time but unrelated to orienting or executive control, while ADHD-I symptoms showed no association with ANT measures.

Most studies indicate that SCT is unrelated to alerting and executive control networks, though controversy exists regarding the orienting network. Two studies found poorer orienting network efficiency in SCT groups compared to ADHD and control groups. Notably, these two studies used adult samples, while two child studies found no association between SCT and the orienting network, suggesting potential developmental differences in attentional network impairments between children and adults with SCT.

Studies using the Continuous Performance Test (CPT) have examined sustained attention in CDS/SCT, yielding mixed results (Becker, 2025). Some research found negative correlations between CDS symptoms and sustained attention, with more severe CDS symptoms associated with poorer sustained attention (Jarrett et al., 2020; Ünsel-Bolat et al., 2020; Willcutt et al., 2014). Willcutt et al. (2014) found SCT positively correlated with omission errors on CPT tasks in children with and without ADHD, with the correlation remaining significant after controlling for ADHD-I and ADHD-HI symptoms. Jarrett et al. (2020) found SCT positively correlated with commission errors on CPT-II tasks. Ünsel-Bolat et al. (2020) found children with ADHD-I showed more omission errors than the SCT+ADHD-I group, while the SCT+ADHD-I group showed no significant difference from healthy controls in omission errors but more commission errors than healthy controls. Both Jarrett et al. (2020) and Ünsel-Bolat et al. (2020) found associations between SCT and increased commission errors, suggesting attentional inhibition deficits in SCT populations.

However, conflicting findings exist. Capdevila-Brophy et al. (2014) found children with ADHD+SCT showed better sustained attention performance than ADHD-SCT children. Wu et al. (2022), using the Cambridge Neuropsycho-

logical Test Automated Battery (CANTAB), supported Capdevila-Brophy et al. (2014), finding the ADHD-SCT group showed poorer sustained attention than the ADHD+SCT group in simple conditions, while SCT symptoms alleviated sustained attention problems in children with ADHD in complex conditions, suggesting task complexity as a moderating variable. Krone, Bédard et al. (2023) found SCT severity unrelated to CPT measures but related to ANT measures, whereas ADHD severity correlated with commission and omission errors on CPT but not ANT measures. This double dissociation provides further objective evidence for the neurocognitive independence of SCT and ADHD. Task complexity may affect sustained attention performance in children with SCT, warranting future validation using tasks of varying complexity.

Additionally, research using the perceptual load paradigm found SCT associated with abnormal early selective attention, while selective attention functioned normally in children with ADHD (Huang-Pollock et al., 2005). Kim et al. (2021) found SCT groups had problems both engaging and disengaging attention, suggesting dysfunction in early information processing or visual selective attention. However, Capdevila-Brophy et al. (2014) found no significant differences in selective attention between ADHD adolescents with high versus low SCT symptoms.

Overall, most studies indicate characteristic impairments in attention networks among CDS/SCT populations, though sustained and selective attention require further investigation. Specifically, SCT appears unrelated to alerting and executive control networks, with controversy surrounding the orienting network. Two studies found poorer orienting network efficiency in SCT groups compared to ADHD and control groups. Future research should control for ADHD symptoms, compare attentional functioning impairments between adults and children, and employ experimental paradigms with varying complexity to examine attentional problems in CDS.

1.2 Mind Wandering

Mind wandering refers to spontaneous thinking with weak constraints on thought content, sharing similarities with daydreaming—a cardinal symptom of SCT (Becker & Barkley, 2021). Mind wandering and CDS overlap conceptually and empirically, and examining their relationship helps clarify the nature of CDS.

Research investigating the relationship between CDS/SCT and mind wandering has yielded consistent results: more severe SCT symptoms correlate with more severe mind wandering. Fredrick, Kofler et al. (2020) studied college students using the Imaginal Process Inventory (IPI) and Mind Excessively Wandering Scale (MEWS). Regression analyses revealed that SCT, ADHD, anxiety, and depression all specifically correlated with higher MEWS scores, while only SCT specifically correlated with IPI scores. Fredrick and Becker (2021) subsequently used the IPI scale and found, through regression analysis, that self-reported SCT symptoms in adolescents with ADHD significantly positively correlated

with mind wandering, while ADHD, anxiety, and depression showed no significant correlation with mind wandering—consistent with Fredrick et al. (2020). Higher CDS symptoms more strongly correlate with increased mind wandering compared to ADHD-I symptoms (Becker, 2025).

Previous research demonstrates positive correlations between CDS and mind wandering, with the IPI scale effectively distinguishing CDS from ADHD, anxiety, and depression. However, current studies rely primarily on self-report measures with substantial subjectivity. Future research should incorporate objective measurement methods and use multiple assessment approaches to validate existing findings from different perspectives. Additionally, longitudinal designs could examine how the relationship between CDS symptoms and mind wandering changes over time.

1.3 Processing Speed

Some studies have found associations between CDS/SCT scores and slower processing speed or longer reaction times (Krone, Adler, et al., 2023; Tamm et al., 2023; Uzun Cicek et al., 2023; Wu et al., 2022). Tamm et al. (2023) used the Trail Making Test for Children (TMT-C) and found CDS symptoms associated with slower TMT-C Part A speed, while ADHD-IN symptoms correlated with faster TMT-C Part A performance. However, Wu et al. (2022) using the TMT found the ADHD+SCT group showed significantly slower processing speed than controls, but no significant difference between ADHD+SCT and ADHD-SCT groups, suggesting both SCT and ADHD symptoms slow processing speed. Other researchers found nonsignificant or weak correlations between this disorder and processing speed (Cerny et al., 2023; Gambarini et al., 2023; Mayes, Bangert, et al., 2023). Cerny et al. (2023) found adult CDS symptoms showed no significant correlation with TMT Part A but significantly negatively correlated with the processing speed index of the Wechsler Adult Intelligence Scale-4th Edition (WAIS-IV), while ADHD symptoms showed no correlation with either test. These discrepancies may relate to sample types and measurement methods. Becker (2025) noted that most studies used suboptimal CDS measurement methods or limited processing speed assessments, potentially compromising reliability. Additionally, research with school-aged children found that controlling for demographic variables, both CDS symptoms and ADHD-IN symptoms significantly correlated with cognitive flexibility (Tamm et al., 2023). However, after controlling for ADHD-IN symptoms, SCT symptoms showed no significant correlation with cognitive flexibility (Tamm et al., 2016).

Research on the relationship between CDS and processing speed remains controversial, representing one reason for the terminology change from SCT (Becker, 2025).

1.4 Behavioral Regulation Executive Functions

Executive functions represent higher-order cognitive processes responsible for goal-directed behavior, including planning, organization, coordination, inhibition, shifting, and updating. Executive function deficits significantly distinguish adults with ADHD from those with SCT, with the ADHD+SCT group showing significantly higher executive control deficit scores than the ADHD-SCT group (Krone, Adler, et al., 2023). Most CDS research has employed the Behavior Rating Inventory of Executive Function (BRIEF) for assessment. According to BRIEF standards, behavioral inhibition, task shifting, emotional control, and self-monitoring constitute behavioral regulation abilities, forming the Behavioral Regulation Index; while initiating behavior, working memory, planning/organization, task monitoring, and organization of materials constitute cognitive aspects of executive function, forming the Metacognition Index (Krone, Adler, et al., 2023). Research indicates that ADHD-HI symptoms predict behavioral regulation executive function deficits, while ADHD-I and SCT symptoms predict metacognitive executive function deficits (Becker & Langberg, 2014). The ADHD+SCT group shows more severe metacognitive deficits than the ADHD-SCT group (Capdevila-Brophy et al., 2014; Krone, Adler, et al., 2023).

Regarding behavioral regulation executive functions, CDS correlates with poorer emotional control, emotional regulation, self-monitoring, and task shifting (Barkley, 2013; Becker, 2025; Capdevila-Brophy et al., 2014; Krone, Adler, et al., 2023). ADHD-I, ADHD-HI, and SCT-sluggishness all positively predict emotional regulation problems, though ADHD symptoms show stronger predictive power (Barkley, 2013). After controlling for anxiety and depression symptoms, no significant differences in self-monitoring scores emerged between ADHD+SCT and ADHD-SCT groups (Capdevila-Brophy et al., 2014). ADHD-I and ADHD-HI relate to poorer self-restraint, while SCT relates to stronger self-restraint (Barkley, 2013; Godoy et al., 2023). Barkley (2013) examined differential effects of SCT dimensions, finding ADHD-I, ADHD-HI, and SCT-sluggishness all associated with lower motivation, while SCT-daydreaming associated with higher motivation. Regarding behavioral inhibition, three studies using ADHD+SCT and ADHD-SCT samples yielded different conclusions: Capdevila-Brophy et al. (2014) found higher behavioral inhibition scores in ADHD-SCT children; Krone, Adler et al. (2023) found higher scores in ADHD+SCT adults; while Wu et al. (2022) found no significant differences between child groups—requiring further validation.

The CDS/SCT population shows specific impairments in behavioral regulation executive functions. Specifically, ADHD-IN, SCT-sluggishness dimension, and ADHD-HI all relate to poorer emotional regulation, with ADHD symptoms showing stronger predictive effects. ADHD symptoms correlate with poorer self-restraint, while SCT correlates with stronger self-restraint. Both ADHD symptoms and SCT-sluggishness dimension relate to weaker motivation, while SCT-daydreaming dimension relates to stronger motivation. The relationship

between CDS/SCT and behavioral inhibition requires further investigation. Future research should control for anxiety, depression, and related symptoms, incorporate CDS subdimensions, and conduct longitudinal studies examining dynamic changes in behavioral regulation executive functions in CDS populations.

1.5 Metacognitive Executive Functions

Regarding cognitive aspects of executive function, CDS correlates with poorer task monitoring and planning/organization (Krone, Adler, et al., 2023; Wu et al., 2022). Capdevila-Brophy et al. (2014) found no significant differences in planning/organization scores between ADHD+SCT and ADHD-SCT children, though this study used clinical samples with small sample sizes. SCT shows no association with time management problems, while ADHD-IN relates to poorer time management (Barkley, 2013; Godoy et al., 2023). ADHD-IN, SCT, and ADHD-HI all relate to poorer organization and problem-solving, with ADHD-IN showing stronger predictive effects (Barkley, 2013). Godoy et al. (2023) found that poorer organization/problem-solving most strongly predicted SCT, while poorer time management most strongly predicted ADHD-IN. Kamradt et al. (2022) found time management and organization problems influenced internalizing problems through individual differences in SCT. Regarding initiating behavior and organization of materials, child studies found no significant differences between ADHD+SCT and ADHD-SCT groups (Capdevila-Brophy et al., 2014; Wu et al., 2022), while adult studies found significantly higher scores in ADHD+SCT groups (Krone, Adler, et al., 2023), suggesting age-related differences requiring longitudinal investigation.

Current research shows disagreement regarding whether working memory is impaired in CDS/SCT, consistent with Becker (2025). Previous studies found SCT unrelated to working memory, while ADHD-I symptoms negatively correlated with working memory (Bauermeister et al., 2012; Wåhlstedt & Bohlin, 2010), though these studies used composite working memory scores from multiple tests with questionable reliability and validity. Other research found positive correlations between preschool SCT symptoms, ADHD-I symptoms, and working memory (Tamm et al., 2016), but after controlling for ADHD-I symptoms, SCT symptoms showed no significant correlation with working memory (Camprodon-Rosanas et al., 2020; Tamm et al., 2016), highlighting the importance of controlling for ADHD symptoms. Some studies reached different conclusions: McBurnett et al. (2014) identified working memory problems as a factor of SCT in children with ADHD-I through exploratory analysis. Multiple studies found significant negative correlations between CDS/SCT symptoms and working memory (Camprodon-Rosanas et al., 2020; Skirbekk et al., 2011; Tamm et al., 2023). Two BRIEF studies found more severe working memory problems in ADHD+SCT groups than ADHD-SCT groups (Krone, Adler, et al., 2023; Wu et al., 2022), suggesting SCT symptoms may exacerbate working memory problems in ADHD populations.

The CDS/SCT population shows specific impairments in metacognitive executive functions. Specifically, SCT is unrelated to time management, while ADHD-I relates to poorer time management. ADHD-IN, SCT, and ADHD-HI all relate to poorer organization and problem-solving, with ADHD-IN showing stronger predictive effects. Poorer organization/problem-solving most strongly predicts SCT, while poorer time management most strongly predicts ADHD-IN. CDS/SCT symptoms may worsen working memory problems in ADHD patients. The relationship between CDS/SCT and initiating behavior and organization of materials requires further investigation. Future research should control for ADHD-I symptoms and other covariates. Given that previous research on metacognitive executive function problems in CDS/SCT patients has focused primarily on children with ADHD, future studies should strengthen investigations of adolescent and adult populations and other disorder types. Additionally, longitudinal studies should examine dynamic changes in metacognitive executive functions in CDS populations.

2. Characteristic Social Functioning Impairments in Cognitive Disengagement Syndrome

Individuals with CDS/SCT experience not only cognitive impairments but also significant social functioning problems. Research on social functioning impairments in CDS/SCT has primarily focused on academic problems, internalizing and externalizing problems, and other social life issues. Through a review of recent literature, this paper synthesizes a schematic diagram illustrating the characteristic social functioning impairments of CDS relative to other disorders (Figure 2 [Figure 2: see original paper]).

2.1 Academic Problems

Both CDS/SCT and ADHD-IN relate to poorer academic functioning (Becker, Martinez, et al., 2023; Fredrick & Becker, 2023b; Moreno-García et al., 2022), with CDS symptoms frequently correlating with poorer academic functioning even after controlling for ADHD symptoms (Becker, 2025). Network analysis revealed that SCT symptoms "easily confused" and "difficulty expressing thoughts" and ADHD-IN symptoms "sustained attention" and "continuous mental effort tasks" showed specific associations with academic impairment, while depression symptoms showed no specific association with academic impairment. Latent variable models showed ADHD-IN had stronger unique associations with academic impairment than SCT, with depression showing no significant unique association with academic impairment. Both models support the validity of SCT symptoms relative to ADHD-IN and depressive symptoms (Burns et al., 2022).

Research with children with reading disorders found cross-sectional negative correlations between SCT and academic performance, with ADHD-IN showing no moderating effect. However, longitudinal analyses revealed ADHD-IN modera-

tion, such that SCT negatively correlated with academic performance only in individuals with low ADHD-IN levels, but not in those with high ADHD-IN levels (Hossain et al., 2022), highlighting the importance of controlling for ADHD-IN symptoms. After controlling for ADHD-I symptoms, children's CDS/SCT symptoms correlated with poorer academic performance and homework completion, lower math fluency, poorer organizational skills, and lower academic motivation and skills (Becker, Epstein, et al., 2022; Becker, Martinez, et al., 2023). The Wechsler Individual Achievement Test-III (WIAT-III) basic reading and numerical operations specifically negatively correlated with ADHD-IN symptoms, but not with CDS (Becker, Martinez, et al., 2023). High school student research found SCT significantly correlated with academic burnout, weaker academic motivation, and less academic engagement, with SCT remaining significantly negatively correlated with academic engagement after controlling for ADHD symptoms (Wang et al., 2023; Wei & Chen, 2022). SCT's negative impact on adolescent academic achievement was mediated by academic engagement, with stress moderating the effect of SCT on academic engagement—at higher stress levels, adolescents with SCT showed greater academic engagement than typical adolescents (Wang et al., 2023).

In summary, both CDS and ADHD-I symptoms relate to academic impairment, with ADHD-I showing stronger associations, a conclusion supported by Becker's (2025) review. Depression is unrelated to academic impairment. Specifically, CDS/SCT correlates with poorer academic performance and homework completion, lower academic motivation and engagement, with significant correlations remaining after controlling for ADHD symptoms. Future research should further examine moderating factors affecting the relationship between CDS and academic functioning and validate conclusions across different samples and specific learning domains.

2.2 Internalizing and Externalizing Problems

Based on varying degrees of sociocultural differences among symptoms, psychopathological problems can be divided into internalizing symptoms (emotional disorders such as depression, anxiety, withdrawal, shyness, and loneliness) and externalizing problems (behaviors that violate social norms or behavioral standards, such as aggression, substance abuse, criminal behavior, and oppositional defiant disorder [ODD]). Compared to hyperactivity-impulsivity and other externalizing symptoms, SCT shows stronger correlations with internalizing symptoms that remain stable after controlling for ADHD symptoms, while SCT shows no correlation or negative correlation with externalizing symptoms (Becker et al., 2016). Furthermore, childhood CDS symptoms predict adolescent and adult internalizing symptoms (Becker, 2025).

Most CDS/SCT internalizing problem research has focused on depression and anxiety. Studies found significant positive correlations between SCT symptoms and anxiety and depression (Becker, Willcutt, et al., 2023; Mayes, Waschbusch, et al., 2023; Wood et al., 2020). Both SCT and ADHD-IN scores positively pre-

dicted anxiety and depression severity (Moreno-García et al., 2022), though CDS showed stronger specific associations with anxiety and depression than ADHD-IN (Burns et al., 2023). Depression also positively predicted CDS (Mayes, Waschbusch, et al., 2023). Longitudinal depression research found SCT scores predicted more severe depressive symptoms at follow-up after controlling for ADHD-IN (Fredrick, Langberg, et al., 2022; Servera et al., 2016), though Hossain et al. (2022) found no significant longitudinal association between SCT and depression. Variations in sample types and longitudinal intervals across studies require further validation.

Research has further examined relationships between CDS/SCT and anxiety, finding CDS significantly positively correlated with somatic anxiety and generalized anxiety (Scaini et al., 2023). SCT, ADHD-I, and ADHD-HI symptoms all positively correlated with fear of social evaluation and social anxiety, but only SCT moderated the relationship between fear of social evaluation and social anxiety—higher SCT levels strengthened this association (Fredrick, Becker, et al., 2020). Additionally, ADHD plays an important role in the association between SCT and anxiety. Children with comorbid anxiety and ADHD showed higher SCT levels than those with anxiety or ADHD alone (Skirbekk et al., 2011). Another longitudinal study with children with reading disorders found positive correlations between SCT and anxiety only in individuals with low ADHD-I symptoms (Hossain et al., 2022). Thus, both CDS and ADHD-IN positively predict anxiety and depression, with CDS showing stronger specific associations. ADHD moderates the relationship between CDS and anxiety, while CDS moderates the relationship between fear of social evaluation and social anxiety. Longitudinal associations between CDS and depression require further investigation.

Researchers have also examined relationships between CDS/SCT and internalizing symptoms such as social withdrawal and somatic complaints. Shyness represents a subdomain of social withdrawal, with adolescents potentially showing social withdrawal due to shyness (Fredrick & Becker, 2023a). Becker (2025) found that when considering both CDS and ADHD symptoms, higher CDS symptoms specifically correlated with increased social withdrawal and conflicted shyness. SCT positively predicted shyness, while ADHD-IN showed no significant correlation with shyness (Moreno-García et al., 2022; Sáez et al., 2019). Both CDS and ADHD-IN positively predicted social withdrawal, while ADHD-HI symptoms negatively predicted social withdrawal, with SCT mediating the association between ADHD-I and social withdrawal (Fırat et al., 2019; Sevincok et al., 2019). Among children with ADHD and autism, those with high CDS scores showed higher proportions of withdrawal/shyness behaviors. CDS, autism, and anxiety positively predicted withdrawal/shyness behaviors, though with smaller effects than autism and anxiety (Mayes, Calhoun, et al., 2023). Tahıllıoğlu et al. (2023) found SCT positively predicted autistic-like traits (ALTs) in children with ADHD, while ADHD-IN negatively predicted ALTs. ALTs positively predicted SCT, with this effect slightly decreasing when ADHD-IN was included in the model, suggesting ADHD-IN may mediate the effect of ALTs on SCT.

Furthermore, SCT scores positively predicted somatic complaints, while ADHD-I and ADHD-HI showed no significant association with somatic complaints (Burns et al., 2023; Sevincok et al., 2019). A longitudinal study showed somatic complaints significantly positively correlated with baseline and follow-up CDS (Mayes, Waschbusch, et al., 2023). These findings indicate CDS positively predicts withdrawal/shyness behaviors, autistic traits, and somatic complaints, while ADHD symptoms show no association with shyness or somatic complaints. ADHD-IN positively predicts social withdrawal but negatively predicts autistic traits, while ADHD-HI negatively predicts social withdrawal, with autism and anxiety showing stronger predictive effects on withdrawal/shyness behaviors.

Research on CDS/SCT and externalizing problems has primarily focused on oppositional defiant disorder (ODD). Children with SCT show significantly lower ODD rates than children with ADHD (Barkley, 2013), with SCT showing no significant correlation with ODD, while ADHD-HI positively predicted ODD (Fırat et al., 2019). Some studies found positive correlations between SCT and ODD, but without controlling for ADHD scores (Wåhlstedt & Bohlin, 2010). Multiple studies show that after controlling for SCT, higher ADHD-IN predicted higher ODD and ADHD-HI symptoms; after controlling for ADHD-IN, higher SCT predicted lower ADHD-HI symptoms, but SCT showed no significant association with ODD (Penny et al., 2009; Servera et al., 2016). Other research found ADHD-HI symptoms positively correlated with delinquent behavior and aggression, while SCT and ADHD-I symptoms showed no association with these behaviors (Sevincok et al., 2019). Further research found almost no correlation between SCT and externalizing problems, while ADHD-IN symptoms significantly correlated with externalizing problems (Moreno-García et al., 2022). These studies indicate SCT shows no association with externalizing problems such as ODD, delinquent behavior, and aggression, while ADHD symptoms positively predict ODD, and ADHD-HI positively correlates with delinquent and aggressive behaviors. Additionally, SCT negatively predicts ADHD-HI, while ADHD-IN positively predicts ADHD-HI.

In summary, CDS positively predicts internalizing problems including anxiety, depression, withdrawal/shyness behaviors, autistic traits, and somatic complaints, showing distinct impairment profiles from ADHD, autism, anxiety disorders, and depressive disorders. CDS shows no association with externalizing problems such as ODD, delinquent behavior, and aggression, while ADHD symptoms correlate with externalizing problems. These conclusions align with Becker (2025). The relationship between CDS and anxiety and autistic traits is moderated by ADHD-I symptoms. Future research should examine whether other factors moderate relationships between CDS and internalizing problems. Additionally, relationships between CDS and externalizing problems beyond ODD require further investigation.

2.3 Other Social Life Problems

Research demonstrates associations between CDS/SCT symptoms and sleep problems in children (Burns et al., 2023; Cano-Crespo et al., 2023; Fredrick, Yeaman, et al., 2022; Mayes, Waschbusch, et al., 2023; Yucens et al., 2024). Adolescents with prominent CDS symptoms show more significant sleep difficulties than those with prominent ADHD symptoms (Becker, 2025). Mothers reported more sleep problems than fathers, highlighting the importance of multiple raters (Cano-Crespo et al., 2023). CDS showed stronger associations with daytime and nighttime sleep disturbances than ADHD-IN (Burns et al., 2023). Fredrick, Yeaman et al. (2022) combined subjective and objective measures, finding SCT associated with poorer sleep quality, increased daytime sleepiness, and later circadian preference after controlling for ADHD symptoms. In obese adolescents, SCT scores significantly correlated with daytime sleepiness after controlling for ADHD symptoms (Öğütlü et al., 2023). A longitudinal study found insomnia and hypersomnia significantly positively correlated with baseline and follow-up CDS, with baseline ADHD-HI and autistic symptoms positively predicting follow-up insomnia, though baseline CDS showed no significant predictive effect on follow-up insomnia (Mayes, Waschbusch, et al., 2023). These findings indicate stronger associations between CDS and daytime/nighttime sleep disturbances compared to ADHD-IN. CDS, ADHD-HI, and autistic symptoms show different predictive effects on follow-up insomnia. Experimental data show that shortened sleep duration increases CDS symptoms, indicating the need for more experimental and longitudinal research to test causal relationships and directional effects (Becker, 2025).

Studies have examined social functioning impairments in children with CDS/SCT. Both SCT and ADHD-IN scores positively predicted social impairment, with ADHD-IN showing stronger predictive effects (Sáez et al., 2019). However, Burns et al. (2023) found both CDS and ADHD-IN positively correlated with social impairment and peer rejection, with no significant difference between the two symptom types. Mayes, Calhoun et al. (2023) found children with autism, ADHD, and healthy controls with high CDS scores showed higher proportions of peer rejection. CDS positively predicted peer rejection behaviors, though with smaller effects than autism and depression. Yung et al. (2021) found that after controlling for ADHD symptoms, sustained and selective attention measures still predicted social problem severity in children with SCT, indicating that social problems in children with SCT relate to sustained attention and attentional control deficits. Becker (2025) found that when considering both CDS and ADHD symptoms, higher CDS symptoms associated with more social isolation and withdrawal and lower social participation. Current research indicates that peer rejection can distinguish CDS from autism and depressive symptoms, though whether social impairment can differentiate CDS from ADHD-I groups requires further investigation.

Research has also explored relationships between CDS/SCT and child weight, with inconsistent findings regarding associations with BMI (Öğütlü et al., 2023;

Roberts et al., 2023). Öğütlü et al. (2023) found that in obese adolescents, emotional eating and food enjoyment scores positively correlated with SCT scores, but these correlations became nonsignificant after controlling for ADHD symptoms. Roberts et al. (2023) using clinical samples found ADHD symptoms also unrelated to BMI, but CDS hypoactivity dimension positively predicted child BMI while daydreaming dimension negatively predicted child BMI. These studies indicate that both CDS and ADHD symptoms are unrelated to child BMI, though small sample sizes warrant further validation.

Researchers have also examined the impact of CDS/SCT symptoms on adult life, though with varying content. Wood et al. (2020) found both ADHD-I and SCT positively predicted procrastination, with ADHD-HI negatively predicting procrastination and anxiety and depression unrelated to procrastination. Shirdel et al. (2023) added driving behavior as a variable, finding ADHD symptoms, SCT symptoms, and driving behavior significantly positively correlated, with procrastination mediating the relationship between ADHD/SCT symptoms and driving behavior. Gul et al. (2023) found that in medical students and residents, ADHD-I symptoms and CDS daydreaming and sluggishness dimensions significantly positively predicted internet addiction, with CDS dimensions showing stronger effects; sluggishness dimension significantly positively predicted internet gaming disorder, while ADHD-IA and ADHD-HI showed no significant effects. Rhodes et al. (2023) found ADHD symptoms positively correlated with e-cigarette and combustible cigarette withdrawal symptoms, with SCT moderating the relationship between ADHD and withdrawal symptom severity—more severe SCT symptoms intensified this effect. These findings indicate that procrastination can distinguish CDS from ADHD, anxiety, and depression, and internet gaming disorder can distinguish ADHD from CDS, though these conclusions require further validation.

In summary, CDS/SCT relates to health and behavioral problems in children such as sleep disturbances and social impairment. Current research shows that CDS exhibits distinct impairment profiles from ADHD, autism, depressive disorders, and anxiety disorders in daytime sleep disturbances, nighttime sleep disturbances, insomnia, and peer rejection. CDS and ADHD both show no association with BMI, while whether social impairment, procrastination, and internet gaming disorder can distinguish CDS from related disorder groups requires further investigation. Autism and depressive symptoms substantially impact children's sleep and peer rejection, and should be included as covariates in future research. Additionally, current research primarily uses subjective report methods; future studies should employ more objective measurement methods to further examine whether CDS affects child weight and adult life.

3. Characteristic Neural Mechanism Impairments in Cognitive Disengagement Syndrome

Overall, few studies have examined the neural mechanisms of CDS/SCT, though most evidence points to associations between CDS and abnormalities in the

dorsal attention network (DAN) and default mode network (DMN) (Wiggs et al., 2023).

Some studies have used MRI methods to examine brain structure related to CDS/SCT, though findings remain inconsistent. Camprodon-Rosanas et al. (2019) used diffusion tensor imaging (DTI) and found normal white matter structure in all regions in school-aged children, unaffected by SCT symptoms. However, Ünsel-Bolat et al. (2020) using DTI found children with SCT+ADHD-I showed higher fractional anisotropy (FA) in bilateral internal capsule anterior/posterior limbs, bilateral cerebral peduncles, and fornix compared to healthy children. A study with ADHD adolescents and controls found that reduced ADHD-HI symptoms associated with decreased FA in the left corticospinal tract, while ADHD-IA symptom improvement showed no FA association (Francx et al., 2015). Whether white matter microstructure can distinguish CDS from ADHD requires further investigation. Additionally, anatomical analyses indicate SCT symptoms correlate with larger volumes in specific frontal regions, including the frontal operculum and dorsal frontal regions centered at the premotor-prefrontal cortex junction. The dorsal frontal region closely relates to the dorsal attention network, suggesting that cognitive sluggishness associates with network abnormalities in higher-order cognitive processes, consistent with the pervasive social life problems in children with SCT (Camprodon-Rosanas et al., 2019). A meta-analysis of MRI studies in ADHD populations found ADHD symptoms associated with smaller volumes in subcortical structures including the amygdala, medulla, and hippocampus (Hoogman et al., 2017). CDS symptoms associate with cortical abnormalities, while ADHD symptoms associate with subcortical abnormalities, indicating different neural bases for CDS and ADHD. However, whether cortical and subcortical changes can effectively distinguish CDS from ADHD requires further research (Camprodon-Rosanas et al., 2019).

Further research has used fMRI methods to examine brain function in CDS/SCT, yielding different results. Fassbender et al. (2015) used a cued flanker paradigm with ADHD adolescents and found left superior parietal lobe (SPL) hypoactivity associated with SCT symptoms, while supplementary motor area (SMA) hyperactivity and bilateral thalamus hyperactivity associated with ADHD-I symptoms. These findings suggest SCT may involve impaired attentional reorienting or shifting, indicating that attention networks may differentiate SCT from ADHD-I (Becker et al., 2016). Camprodon-Rosanas et al. (2019) found, in school-aged children, that SCT symptoms associated with lower segregation between the DMN and dorsolateral brain networks, both involving dorsal frontal regions. Longitudinal studies are needed to determine whether this functional connectivity abnormality recovers during development or becomes a characteristic neural mechanism in children with CDS. Kardaş et al. (2021) used a Go/no-Go task and found that during Go trials, children with SCT+ADHD showed significantly increased activation in posterior brain regions (occipital areas, angular gyrus, lateral occipital cortex, and superior/inferior brain regions) compared to healthy children, while no

group differences emerged during no-Go trials. This suggests that individuals with SCT require increased posterior brain region activation when attention is needed, possibly representing a compensatory mechanism for attentional deficits.

Researchers have also used EEG methods to examine brain electrical activity in CDS/SCT. Jarrett et al. (2017) conducted resting-state EEG measurements in children with ADHD and healthy children, finding no significant correlation between SCT symptoms and any EEG indices. ADHD symptoms positively correlated with the ratio between theta and beta frequencies (TBR) in frontal and frontocentral regions, while SCT symptoms showed no significant correlation with TBR, suggesting differential frontal brain involvement in ADHD versus CDS.

Current research indicates that CDS/SCT relates to abnormalities in the dorsal attention network and default mode network. CDS and ADHD populations differ in white matter structure, TBR in frontal and frontocentral regions, and brain regions activated during cued flanker tasks. CDS and ADHD comorbid children also differ from healthy children in brain regions activated during Go/no-Go tasks, though these findings require further validation. Most existing studies have selected samples based on ADHD symptoms; future research should select participants based on CDS symptoms. Additionally, future studies should employ different experimental paradigms for neural mechanism research, compare CDS-related brain regions with those in ADHD and other disorders, and further clarify the characteristic neural mechanisms of CDS.

4. Summary and Future Directions

Cognitive functioning impairment research shows that the CDS/SCT population exhibits characteristic impairments in mind wandering, self-restraint, emotional regulation, motivation, and other behavioral regulation executive functions, as well as in time management, organization/problem-solving, and working memory as metacognitive executive functions. However, attention networks, selective attention, and processing speed require further investigation. Social functioning impairment research demonstrates characteristic impairments in academic impairment, sleep problems, peer rejection, and internalizing problems including anxiety, depression, withdrawal/shyness, autistic traits, and somatic complaints, as well as externalizing problems including ODD, delinquent behavior, and aggression. Neural mechanism research indicates that CDS relates to abnormalities in the dorsal attention network and default mode network, with differences between CDS and ADHD populations in white matter structure, TBR in frontal and frontocentral regions, and task-activated brain regions, though findings require further validation. In summary, accumulating evidence demonstrates that cognitive disengagement syndrome is an independent psychological disorder with distinct cognitive functioning impairments, social functioning impairments, and neural mechanisms that differ from ADHD and related disorders. However, CDS research remains in its early stages, and future research should

address the following areas:

4.1 CDS as an Independent Disorder

Based on extensive literature review, Becker (2025) proposed three possibilities for conceptualizing CDS: a unique disorder, a diagnostic indicator, or a transdiagnostic dimension. Since Barkley (2014) proposed that SCT may represent a disorder distinct yet related to ADHD, researchers have endeavored to identify differences between CDS and other disorders. This paper systematically reviews distinctions between CDS and ADHD, autism, and other disorders across cognitive, social, and neural mechanisms, providing multidimensional evidence supporting CDS as a unique disorder and supporting Becker's (2025) first possibility. Clarifying the unique characteristics of CDS helps exclude the possibility of conceptualizing CDS merely as a special case of ADHD-I or as a transdiagnostic dimension common to many mental disorders. Conceptualizing CDS as an independent disorder will promote systematic research, increase societal attention to CDS populations, advance personalized educational and medical support measures, and promote patient recovery and quality of life improvement. Future research should further reveal specific impairments and heterogeneity in cognitive and brain functions that distinguish CDS from other related disorders, and further differentiate CDS from broader psychological symptoms such as burnout, school aversion, neurasthenia, inertia, "lying flat," and "Buddhist-style" apathy, as these problems also manifest as lack of motivation, staring blankly, and muddle-headedness. Such research will deepen understanding of CDS independence and connect CDS research with broader real-world problems. However, establishing CDS as an independent mental disorder requires caution and awaits broader academic consensus in the field.

4.2 Lifespan Developmental Course of CDS Characteristics

This review primarily focuses on school-aged children, with limited literature on adult samples. Existing research suggests potential differences in impairment between children and adults with CDS in orienting networks, behavioral inhibition, and other domains (Camprodon-Rosanas et al., 2020; Capdevila-Brophy et al., 2014; Kim & Kim, 2021; Kim & Lee, 2022; Krone, Adler, et al., 2023; Krone, Bédard, et al., 2023; Wu et al., 2022). Do such differences exist across other functional dimensions? Future research should enrich adult samples to validate existing conclusions. Additionally, research on early childhood, adolescence, and non-college adult samples requires supplementation (Becker, 2025). Identification of CDS characteristics in early childhood is particularly important for early detection and intervention. Understanding the developmental course of CDS characteristics is also essential. Most previous research has used cross-sectional designs, with only a few longitudinal studies. Results across longitudinal studies also differ: Fredrick, Langberg et al. (2022) found CDS scores predicted more severe depressive symptoms at follow-up, while Hossain et al. (2022) found no significant longitudinal association between CDS and depression, in-

dicating the need for more longitudinal research. Do CDS characteristics show regular changes across early childhood, adolescence, and adulthood? Future longitudinal research should conduct longitudinal measurements and tracking throughout child development to more comprehensively observe trajectories of functional impairments and neural mechanisms in CDS populations over time, revealing dynamic change patterns of CDS characteristics. Following Becker's (2025) analysis, we recommend developing developmental norms for CDS from early childhood to adulthood.

4.3 Relationship Between Overall CDS Structure and Subdimensions

As a psychological disorder name or research topic, CDS/SCT has a short history with limited literature. On April 11, 2024, Becker (2025) searched PubMed using ADHD-related terms and obtained 45,823 results, while searching for SCT and CDS yielded only 303 articles—equivalent to the literature volume on ADHD 42 years prior. We offer a different perspective. While CDS as a novel research topic or overall psychological measurement construct indeed has limited literature, searching using CDS subdimension names and related symptoms reveals substantial literature. On May 11, 2025, we searched PubMed using CDS "daydreaming" dimension terms (Daydreaming/disengagement or decoupling of attention and conscious/withdrawal/sleepy appearance) and obtained 121,492 results; using CDS "mental confusion" dimension terms (Mental confusion/fogginess) yielded 862 results; using CDS "hypoactivity" or "slow movement" terms (Hypoactivity/underactivity/passive or sedentary movement/slow, reduced, or delayed motor movements) yielded 186,708 articles. Thus, although CDS is a new research topic, its subdimensions and core symptoms—daydreaming, mental confusion, and hypoactivity—have rich research literature. Therefore, the relationship between the overall psychological structure of this new research topic and its three subdimensions requires in-depth study. Future research should clarify whether CDS represents a unidimensional or multidimensional structure and how to integrate the rich previous research on subdimensions into the CDS theoretical framework. For example, research should clarify how "daydreaming" as a CDS subdimension differs from and connects with previous non-CDS framework daydreaming research. Such research will also help clarify relationships between CDS and other psychological disorders sharing certain symptoms.

4.4 Diversification of CDS Research Methods

As previously discussed, longitudinal CDS research is necessary. Additionally, while current research primarily uses scales or experimental methods, future CDS research should incorporate more sensitive or ecologically valid objective methods such as school report cards, diagnostic interviews, and neuropsychological approaches (Becker, Willcutt, et al., 2023). Current CDS research primarily focuses on functional impairments in this population; future studies should examine potential adaptive significance of CDS characteristics from a positive

psychology perspective and deeply investigate interactions between environmental factors and CDS symptoms. As Becker (2025) noted, participatory methods should be promoted to understand challenges and strengths of CDS populations from the perspective of affected individuals and their support networks.

Most neural mechanism research has examined CDS-related brain regions in resting states, with some studies analyzing brain region activity during cued flanker and Go/no-Go tasks to explore attention deficits in CDS populations (Fassbender et al., 2015; Kardaş et al., 2021). The cognitive aspect of CDS involves attentional disengagement and effortful psychological processing of external environments, while the motor aspect involves hypoactivity (Becker, Willcutt, et al., 2023). Future research should use relevant experimental paradigms based on this definition to validate existing functional impairment conclusions and explain the neural mechanisms underlying functional impairments, providing a foundation for interventions. Additionally, while research has identified specific cognitive and social functioning impairments in CDS, few studies have examined connections between these impairments or how they influence each other. Only one study found that social problems in children with SCT related to sustained attention and attention control deficits (Yung et al., 2021), but this research remained at the correlational level without examining causal process models. Future research should further explore interactions between CDS functional impairment characteristics and their causal process models, which will help reveal intrinsic mechanisms of characteristic functional impairments in CDS and enable targeted interventions.

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