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Examining the Moderating Role of Sense of Coherence in the Relationship Between ADHD Symptoms and Antisocial Behaviors

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ABSTRACT

Background: Attention-Deficit/Hyperactivity Disorder (ADHD) is a common childhood neurodevelopmental disorder with far-reaching consequences in an individual's life. Individuals with ADHD often encounter challenges such as antisocial behaviors. Given the limited research on protective factors against such behaviors in individuals with ADHD, this study explores the role of *Sense of Coherence* (SOC) as a potential protective factor.

Method: This study employed a correlational design within a descriptive research framework. A sample of 351 female high school students (grade 10–12) from five schools in District 8 of Tehran was selected through multi-stage cluster random sampling. Participants completed the ASRS-V1.1 self-report scale for ADHD symptoms, the antisocial behavior questionnaire by Barrett and Donnellan, and the Flensborg Sense of Coherence Scale. Data were analyzed using Pearson correlation and Hayes' regression analysis via SPSS version 27.

Results: Findings indicated a significant positive correlation (r= 0.24) between ADHD symptoms and antisocial behaviors. Additionally, Sense of Coherence moderated this relationship, reducing its strength by 0.01. Although this moderating effect was modest, it suggested that higher levels of SOC could lessen the association between ADHD symptoms and antisocial behaviors.

Conclusion: Based on the results, individuals with ADHD who possess higher levels of Sense of Coherence exhibit fewer antisocial behaviors. Hence, SOC can be considered a protective factor in mitigating antisocial behaviors among individuals with ADHD.

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Extended Abstract

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder characterized by symptoms such as inattention, hyperactivity, and impulsivity. This disorder typically begins in childhood and persists into adulthood in some individuals. Studies have shown that individuals with ADHD face not only academic and occupational challenges but are also at an increased risk of engaging in antisocial behaviors, such as aggression, law-breaking, and even criminal activities.

Antisocial behaviors refer to a range of individual reactions that violate social norms and laws. Several researches have confirmed that ADHD can be a risk factor for increasing antisocial behaviors, and individuals experiencing higher levels of ADHD symptoms are more likely to engage in such behaviors. Psychotherapeutic theories suggest that this relationship can be influenced by moderating variables—factors that change the strength or direction of the relationship. One such variable is the sense of coherence, which may serve a protective role against antisocial behaviors.

The sense of coherence, introduced by Antonovsky, refers to an individual's feeling of understanding, manageability, and meaningfulness of life. Numerous studies have demonstrated that a high level of sense of coherence is associated with a reduction in aggressive and antisocial behaviors. This research aims to examine the moderating role of the sense of coherence in the relationship between ADHD symptoms and antisocial behaviors.

Method

This study is applied in nature and employs a correlational and descriptive (non-experimental) design. The statistical population consisted of female high school students in District 8 of Tehran during the 2022-2023 academic year. A multi-stage random cluster sampling method was used, and 351 participants were selected according to the Morgan table.

Data collection was conducted using three standardized questionnaires:

1. The Adult ADHD Self-Report Scale (ASRS) to evaluate attention deficit and hyperactivity symptoms.
2. The Antisocial Behavior Questionnaire (STAB), which measures various dimensions of deviant social behaviors.
3. The Felensborg Sense of Coherence Questionnaire, which assesses an individual's comprehensibility, manageability, and meaningfulness.

The collected data were analyzed using SPSS Version 27. Initially, Pearson correlation was performed to examine the relationship between ADHD and antisocial behaviors. Subsequently, Hayes' moderation regression analysis was conducted to assess the moderating role of the sense of coherence. The assumptions for statistical analysis, including the normal distribution of data and the independence of variables, were satisfied, and the results of the statistical analysis were reported as valid.

Results

Statistical analyses indicated a significant relationship between ADHD symptoms and antisocial behaviors. The results showed that increased severity of ADHD symptoms is associated with a higher likelihood of engaging in antisocial behaviors. This relationship is of a positive correlation type; meaning, the more pronounced the symptoms of inattention and hyperactivity in an individual, the greater the probability of displaying maladaptive social behaviors.

Moreover, examining the role of the sense of coherence as a moderating factor revealed that individuals with higher levels of sense of coherence tend to exhibit fewer antisocial behaviors. The statistical analyses confirmed that the moderating effect of the sense of coherence on this relationship is significant. However, the extent of this influence was relatively limited, indicating the presence of

other contributing factors. The components of manageability and meaningfulness played the most significant roles in moderating this relationship, while comprehensibility did not show a significant impact.

Overall, the findings suggest that although ADHD is related to antisocial behaviors, the sense of coherence can somewhat mitigate this relationship. Nonetheless, other psychosocial variables may also influence this relationship and should be examined in future research.

Conclusion

The results of this study demonstrate that ADHD symptoms are directly related to an increase in antisocial behaviors. Individuals with ADHD, especially adolescents, may be more prone to maladaptive behaviors due to deficits in behavioral inhibition and impulsivity. The sense of coherence, as a protective factor, can reduce the severity of such behaviors because it helps individuals better manage their problems and feel more in control of their lives.

The main message of this research is that although the sense of coherence can have a protective effect, its influence is limited. This suggests that to reduce antisocial behaviors among adolescents with ADHD, interventions beyond merely strengthening the sense of coherence are necessary. Educational programs focusing on coping skills, emotional regulation, and enhancing social connections can play a vital role in reducing these behaviors.

Considering the findings of this study, it is recommended that schools develop educational programs aimed at strengthening the sense of coherence and social skills to help decrease antisocial behaviors among adolescents. Additionally, future research should explore other psychological and social factors affecting this relationship to propose more comprehensive strategies for reducing antisocial behaviors.

Ethical Considerations

Ethics Code: All stages of the research were conducted in accordance with relevant ethical standards, and no official authority issued any directives or approvals for this study.

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Authors' Contributions: Reyhaneh Mehdizadeh.: Writing the manuscript, conceptualization, data collection, data management, statistical analyses MohammadAli Mohammadyfar: Project management, supervision, validation, editing, and revision of the manuscript.

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Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a prevalent neurodevelopmental condition characterized by inattention, hyperactivity, and impulsivity, often accompanied by functional impairments in academic, occupational, or social settings (1). Although primarily diagnosed in childhood, ADHD frequently persists into adulthood. Affected individuals often face various challenges, including anxiety, depression, and behavioral difficulties. Studies suggest that excessive internet use and digital addiction in adolescents may contribute to the development of ADHD symptoms (2). As digital media consumption increases among adolescents, the prevalence of ADHD-like symptoms in the general adolescent population is also on the rise, potentially leading to additional long-term complications. Numerous studies have linked ADHD to antisocial and criminal behaviors (3). Adolescents and adults with ADHD, compared to their non-ADHD peers, are more likely to engage with the criminal justice system, facing higher risks of conviction, incarceration, and recidivism (4). ADHD prevalence among

incarcerated populations is significantly high, estimated between 25% to 45%, depending on the measurement method (5). This high prevalence has prompted extensive criminological research in this domain (6). Moreover, verbal and physical aggression—key forms of antisocial behavior—are commonly associated with hyperactivity (7). Individuals with ADHD often struggle with maintaining attention during routine activities, which negatively impacts academic progress and social relationships (8). Specifically, children with ADHD find it particularly challenging to control their behavior in situations requiring stillness or silence, such as during class or meals, due to impaired inhibitory control.

Antisocial behavior, which ranges from criminal to non-criminal acts such as verbal aggression, is one of the functional impairments associated with ADHD. There is a strong correlation between ADHD symptoms and antisocial behavior across various age groups, as demonstrated in multiple studies. According to behavioral inhibition theories related to ADHD, individuals with this disorder exhibit deficient behavioral inhibition, leading them to engage in more risk-taking behaviors than others (9). A longitudinal study examining the impact of childhood ADHD symptoms on adolescent antisocial behavior found that a positive parent-child relationship could moderate this risk. Specifically, among 15-year-olds whose parents showed limited involvement in parenting responsibilities, an increase in ADHD symptoms predicted higher levels of antisocial behavior. In contrast, among adolescents with engaged parents, heightened hyperactivity/impulsivity did not predict increased antisocial behavior (10). Another study revealed that positive parenting moderated the relationship between ADHD symptoms and positive alcohol expectancies among children aged 4–12 (11). At higher levels of positive parenting, ADHD symptoms predicted greater alcohol expectancy, while at lower levels of parenting, ADHD symptoms predicted less expectancy (12).

Further research has shown that even in non-clinical populations, ADHD symptom levels can predict antisocial behaviors after controlling for other risk factors (13). The relationship between ADHD and antisocial behavior remains significant even after adjusting for a wide range of psychosocial variables (4, 5). Thus, there appears to be a meaningful association between ADHD and antisocial behavior.

Some researchers argue that ADHD symptoms exist along a spectrum and do not necessarily result in functional impairment (14, 15). Both symptom severity and functional impact may be mitigated by various protective factors (16). Therefore, identifying protective factors that can reduce the risks associated with ADHD symptoms is crucial. The salutogenic model of health introduces the concept of Sense of Coherence (SOC) as a key protective factor. SOC comprises three components often viewed as a unified construct: **comprehensibility** (cognitive)—the degree to which individuals perceive the world as coherent and predictable; **meaningfulness** (emotional)—the degree to which life is seen as worthwhile; and **manageability** (behavioral)—the extent to which individuals believe they possess the resources to influence real-life situations (17).

Multiple studies have focused on the relationship between a sense of coherence and normative behaviors**.** For instance, low SOC levels are associated with higher rates of criminal behavior and recidivism among young men (18, 19). High SOC levels correlate with reduced antisocial behaviors such as smoking, alcohol consumption, and violence (20–23). Furthermore, a study involving 5,000 participants demonstrated that peer substance use patterns significantly predicted increased substance consumption among adolescents with low levels of sense of coherence, compared to their counterparts with high levels of sense of coherence (24).

This indicates that sense of coherence serves as a moderating factor.

In a 10-year longitudinal study involving 2,314 Finnish participants, Ristkari et al. concluded that higher SOC levels were inversely related to antisocial behaviors such as criminal activity (25). Similarly, a study by Koposov et al. on delinquent Russian adolescents found that SOC mediated the relationship between delinquency and psychological trauma (26). Individuals with persistent antisocial behavior exhibited lower SOC and self-esteem than those whose antisocial behaviors were limited to adolescence (27). These findings collectively suggest that SOC is a moderator of antisocial behavior. High SOC is associated with reduced antisocial tendencies such as smoking, alcohol use, and aggression (20, 21, 23).

Despite the known links between SOC and behavior, few studies have specifically examined how SOC interacts with ADHD symptoms over time. Understanding the developmental relationship between SOC and ADHD is essential for designing interventions aimed at safeguarding individuals against negative mental health outcomes. A study by Kiamarsi et al. on adolescents with ADHD found that low SOC and high emotional dysregulation were associated with decreased life satisfaction (28).

ADHD is the most prevalent psychiatric disorder worldwide, with high prevalence rates among school-aged children and adolescents. One of the most critical functional impairments stemming from ADHD is antisocial behavior, which can harm both the individual and others. Such behaviors jeopardize healthy social development during adolescence—a period crucial for cognitive growth and psychosocial identity formation. Even subclinical ADHD symptoms can result in antisocial behaviors in the general population (13). Thus, identifying factors that moderate the link between ADHD symptoms and antisocial behaviors, and developing relevant intervention and education programs, is of great importance. This study aims to investigate whether SOC plays a moderating role in the relationship between ADHD symptoms and antisocial behaviors and whether it can reduce the strength of this association.

Method

Research Design: This applied research employed a descriptive (non-experimental) correlational design. The statistical population comprised all female high school students in District 8 of Tehran's educational system during the 2022–2023 academic year.

Participants: Due to resource constraints, multi-stage cluster random sampling was employed. Out of 29 available schools, five were randomly selected—three private and two public. The estimated student counts for the private schools were 150, 130, and 100, respectively, while each public school had approximately 160 students. Three classes were randomly chosen from each school. Based on Morgan's sampling table, the sample size was determined to be 351 students.

Inclusion criteria included willingness to participate and current enrollment in a secondary school within District 8. The only exclusion criterion was unwillingness to participate. All ethical guidelines were strictly followed, including clearly stating the study's objectives, protecting participant rights and confidentiality, and respecting participants' rights to withdraw from the study at any time. The data collected in this study were analyzed using SPSS version 27.

Instruments

1. Adult ADHD Self-Report Scale (ASRS) v1.1: The Adult ADHD Self-Report Scale (ASRS), developed by the World Health Organization (WHO) in collaboration with a panel of psychiatrists and researchers, is aligned with the diagnostic criteria of the DSM-5. This scale consists of 18 items across two dimensions: nine items assess

inattention, and the remaining nine assess hyperactivity/impulsivity. Items are rated using a 5-point Likert scale, scored from 0 to 4. Higher scores indicate greater levels of ADHD symptoms, while lower scores reflect fewer symptoms. The total score ranges from 0 to 54. The Persian version of the ASRS was translated and validated by Mokhtari and colleagues in 2015 (29), and it demonstrated good reliability, with a Cronbach's alpha of 0.87. Furthermore, discrimination analysis revealed a sensitivity of 70% and a specificity of 99% for the adult ADHD diagnosis at a cutoff score of 50. In the present study, the reliability of the questionnaire was again assessed using Cronbach's alpha and was found to be 0.83. Since this value exceeds the threshold of 0.70, the instrument is considered reliable for use.

2. Antisocial Behavior Questionnaire: The Antisocial Behavior Questionnaire was developed by Barrett and Donnellan in 2009. This 32-item self-report tool measures dimensions of physical aggression, social aggression, and rule-breaking behavior. Among the 32 items, ten items (1, 4, 7, 10, 13, 16, 19, 22, 25, 28) assess physical aggression; eleven items (3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 32) assess social aggression; and the remaining eleven items (2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 31) assess rule-breaking behavior. Items are rated on a 5-point Likert scale, with scores ranging from 0 to 4. Higher scores indicate more pronounced antisocial behaviors. The total score ranges from 0 to 96. Reported internal consistency reliability for the overall scale is 0.91, with subscale reliabilities ranging from 0.84 to 0.91 for physical aggression, 0.83 to 0.90 for social aggression, and 0.71 to 0.87 for rule-breaking (30). In the current study, the Cronbach's alpha was calculated to be 0.88, confirming the reliability of the instrument.

3. Flensborg Sense of Coherence Questionnaire: Originally developed by Antonovsky and later revised and applied by Flensborg and colleagues in 2005, this questionnaire assesses sense of coherence using 35 items presented on either a 3-point or 5-point Likert scale. For items 1 through 24, scoring follows a 3-point scale: "Yes" = 3, "I don't know" = 2, and "No" = 1. For items 25 through 35, which use a 5-point format, scoring is as follows: responses of "Very satisfied" and "Satisfied" are scored as 3 (highest), "Neutral" as 2, and "Dissatisfied" and "Very dissatisfied" as 1 (lowest). The total score ranges from 35 to 105. Of the 35 items, 11 measure comprehensibility (items 1–7, 25, 26, 33, and 35), 13 assess manageability (items 8–17, 27, 28, and 34), and 11 evaluate meaningfulness (items 18–24, 29–31, and 3). Content and construct validity for the scale were confirmed by Flensborg et al. Reported reliability (Cronbach's alpha) was 0.87 and 0.86 in two separate studies (31). In the present study, Cronbach's alpha for the scale was found to be 0.90, indicating strong internal consistency.

Results

The results revealed that among the students surveyed, the largest age groups were 16 and 17 years old. Depending on their birth month, students in these age groups may be enrolled in any of the 10th to 12th grades, corresponding to the upper secondary level of high school. The majority of participating students were studying in the humanities, natural sciences, and mathematics tracks, respectively.

Table 1. Descriptive Statistics for the Research Variables

Variables	Mean	Standard Deviation	Minimum	Maximum	Skewness	Kurtosis
ADHD	45.46	9.56	28	72	-0.12	-0.08
Antisocial behaviors	56.56	14.45	32	101	0.91	0.05
Comprehensibility	25.82	4.15	15	33	-0.34	-0.47
Manageability	29.24	4.99	15	39	-0.34	-0.42
Meaningfulness	23.66	5.39	11	33	-0.15	-0.85
Total sense of coherence	78.81	13.42	43	110	-0.18	-0.63

The correlation matrix of the studied variables is presented in Table 2.

As shown in **Table 2**, the significance level for the correlation test between ADHD symptoms and antisocial behaviors was less than 0.001, which is below the conventional threshold of 0.05. This indicates a statistically significant relationship between the two variables. Furthermore, the Pearson correlation coefficient was positive, suggesting a direct correlation: higher levels of ADHD symptoms are associated with higher levels of antisocial behavior.

To test the assumption of multicollinearity, the variance inflation factor (VIF) and tolerance coefficients were examined. The relevant values are presented in the following table.

Table 2. Correlation Matrix of the Research Variables

Variables	1	2	3	4	5
1. ADHD	1	-	-	-	-
2. Antisocial behaviors	0.24**	1	-	-	-
3. Total sense of coherence	-0.13*	-0.42**	1	-	-
4. Comprehensibility	-0.10*	-0.35**	0.90**	1	-
5. Manageability	-0.12*	-0.39**	-0.92**	-0.77**	1
6. Meaningfulness	-0.13*	-0.41**	-0.92**	0.74**	0.75**

Note: *P< 0.05, **P< 0.001

Table 3. Variance Inflation Factor (VIF) and Tolerance Coefficients for the Research Variables

Variables	Variance Inflation Factor (VIF)	Tolerance Coefficient
ADHD	1.24	0.80
Comprehensibility	1.33	0.75
Manageability	1.31	0.76
Meaningfulness	0.81	1.22

To fulfill the assumption of multicollinearity, it is necessary that tolerance values exceed 0.10 and that Variance Inflation Factor (VIF) values remain below 10 for all predictor variables.

The results presented in the table confirm that these conditions were satisfied for all variables and their components, validating the assumption.

Hayes regression analysis was conducted to evaluate the moderating effect of sense of coherence, with results shown in **Table 4**.

Table 4. Hayes Hierarchical Regression Results for the Effect of the Moderating Variable "Sense of Coherence"

Interaction Effect	Effect Coefficient	Standard Error	t-value	Significance	Effect Size	F-statistic	Degrees of Freedom	Significance
ADHD and Sense of coherence	-0.01	0.005	-2.37	0.01	0.01	5.65	345	0.01
ADHD and Comprehensibility	-0.02	0.01	-1.61	0.10	0.006	2.60	345	0.10
ADHD and Manageability	-0.03	0.01	-2.40	0.01	0.01	5.79	345	0.01
ADHD and Meaningfulness	-0.02	0.01	-2.17	0.03	0.01	4.73	345	0.03

As indicated in **Table 4**, the significance value for the moderating effect of sense of coherence is 0.01, which is below the 0.05 threshold. This means that the moderating role of sense of coherence in the relationship between ADHD symptoms and antisocial behaviors is statistically significant. The effect size is 0.01, and given its negative sign, the moderating effect is one of reduction. Therefore, the sense of coherence functions as a moderator in the relationship between the independent variable (ADHD symptoms) and the dependent variable (antisocial behaviors) in this study. Although the size of the effect is small (0.01), it is statistically meaningful.

Since the p-value for the comprehensibility component in **Table 4** exceeds 0.05, its moderating role in the relationship between

ADHD symptoms and antisocial behaviors is not statistically significant.

However, the significance values for the manageability and meaningfulness components were 0.01 and 0.03, respectively. Thus, both components show statistically significant moderating effects. Like the overall sense of coherence variable, the effect sizes for these two components were also 0.01. These results support the study's hypothesis that sense of coherence, particularly its manageability and meaningfulness dimensions, serves as a significant moderator in the relationship under investigation.

Discussion

The present study examined the relationship between symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD) and antisocial behavior in adolescent students, as well as the moderating role of the Sense of Coherence (SOC) in this relationship. The findings revealed a positive correlation between ADHD symptoms and antisocial behaviors. This suggests that higher levels of ADHD symptoms are associated with greater engagement in antisocial behaviors. In interpreting this result, it appears that the more individuals struggle with ADHD-related symptoms, the more likely they are to exhibit behaviors that fall under the category of antisocial conduct. Impulsivity—often accompanying ADHD—may lead individuals to easily violate social norms, and thus their behavior may be viewed as antisocial.

The strength of the correlation between ADHD symptoms and antisocial behavior in this study was moderate. This indicates that while the relationship is statistically significant, it is not particularly strong. In other words, ADHD symptoms moderately influence the extent of an individual's antisocial behavior. This implies that antisocial behavior is shaped by a host of other factors—both individual (such as personality traits) and social (such as family background and socioeconomic status).

Some previous studies have directly examined the general link between ADHD and antisocial behavior, including research by Retz, Ginsburg et al. (3), and Cherkasova et al. (32). Other studies have focused on specific forms of antisocial behavior such as criminality, delinquency, substance abuse, and school dropout, as seen in the work of Young and Cocallis (4), Baggio et al. (5), Hu et al. (33), Retz et al. (3), and Kousha et al. (34).

This study also found that the Sense of Coherence plays a statistically significant moderating role in the relationship between ADHD symptoms and antisocial behavior. In other words, SOC acts as a mitigating factor: among individuals with higher levels of SOC, the link between ADHD symptoms and antisocial behaviors weakens. While the moderating effect of SOC was statistically verified, it is important to note that the size of this effect was very small ($\beta = 0.01$). This suggests that although SOC does influence the relationship, its impact in this particular sample was limited. One reason for the modest moderating effect of SOC may lie in the presence of additional psychological and social variables that also shape the relationship between ADHD symptoms and antisocial behavior. A key contextual factor that may have influenced the findings is that this study was conducted during a period of widespread poisoning incidents in schools, which created a climate of anxiety and unrest among students. This heightened tension could have independently increased antisocial behavior among adolescents, regardless of their ADHD symptom levels, thus acting as a confounding variable and diminishing the visible moderating role of SOC.

Few previous studies have specifically examined the moderating role of SOC in the relationship between ADHD symptoms and antisocial behaviors. One notable study by Davidson et al. (35), conducted on a sample of 3,180 individuals aged 15 to 50, found that the relationship between ADHD symptoms and various forms of antisocial

behavior (ranging from mild infractions to serious legal violations) differed depending on the individual's level of SOC. In that study, the moderating effect of SOC ranged from –0.06 to –0.17 depending on the type of antisocial behavior examined.

In summary, individuals with more pronounced ADHD symptoms tend to display higher levels of antisocial behavior. The Sense of Coherence (as defined in Antonovsky's theory) includes three components:

(a) Comprehensibility – perceiving life events as structured and predictable; **(b)** Manageability – believing one has the resources to meet challenges; and **(c)** Meaningfulness – having motivation to confront difficulties actively.

For individuals with ADHD, SOC may moderate antisocial tendencies through the following mechanisms:

- **Comprehensibility** can reduce confusion in interpreting social interactions and prevent aggressive responses to ambiguous stimuli.
- **Manageability** supports frustration tolerance, problem-solving skills, and adaptive coping strategies such as dialogue rather than destructive behavior.
- **Meaningfulness** boosts the motivation to recover from setbacks through positive channels, rather than resorting to impulsive attention-seeking actions.
- **Conflict of Interest** Dr. Mohammad Ali Mohammadifar, the managing editor of the journal, is responsible for this article; however, he had no involvement in the journal's evaluation process, and the review stages were managed by Dr. Eshaq Rahimian-Bogar, the editor-in-chief.

One limitation of this study is its limited generalizability, stemming from cultural, social, economic, and familial differences. Consequently, the findings may not be applicable to students in other cities or provinces, or to different age and social groups.

Given the results, there is a pressing need for schools to identify and address the root causes of antisocial behavior in students. This includes implementing broad-based educational programs aimed at enhancing the Sense of Coherence and offering extracurricular workshops that teach coping strategies and promote SOC development. Parental training programs outside of school settings can also help strengthen SOC in students, further contributing to behavioral improvements. For children with ADHD, meaning-centered cognitive therapy may be particularly effective in increasing the "meaningfulness" component of SOC. In conclusion, the Sense of Coherence not only acts as a buffer preventing ADHD symptoms from manifesting as antisocial behaviors, but also has the potential to improve quality of life even when symptoms persist. Integrated interventions that combine medication, adaptive skills training, and the enhancement of SOC present the most promising path forward in reducing the social harms associated with this disorder.

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