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Social Cognitive Processing across Autism and ADHD: Shared Deficits, Distinct Profiles, and Clinical Implications

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Abstract

Background: *Social challenges are at the core of autism spectrum disorder (ASD) and are also common in attention-deficit/hyperactivity disorder (ADHD). Because the two conditions overlap in behavior and frequently co-occur, it is unclear whether their social difficulties arise from the same social-cognitive mechanisms.*

Aim: *This review integrates literature related to social cognitive processing in ASD and ADHD, describes common and disorder-specific profiles, and consider about implications for assessment and intervention.*

Approach: *We categorize the literature in six domains: social attention, emotion recognition, review each of the conditions (Theory of Mind, Empathy, Social Perception, Social Interpretation), separately and then compare to each other, including the role of co-occurrence of ASD with ADHD.*

Key themes: *In both conditions, there are decreased performance in emotion recognition tasks, Perspective-taking, understanding of complex social situations. However, the evidence cues rather than impairments in social competence, difficulties in ASD are more likely to be the result of differences in social cue processing and social inferences than social competence. In other words, those with ADHD have attentional, inhibitory, executive, and emotion-regulation processes. Unfortunately, there is little ecological validity, and co-occurrence and heterogeneity complicate things.*

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Clinical implications: *Social-cognitive assessment could be useful to describe problems other than diagnostic categories and inform mechanism specific intervention.*

Conclusion: *There are multiple cognitive pathways that can produce similar social outcomes. Future work should use test processes, instead of a diagnosis label only.*

Keywords: autism spectrum disorder; ADHD; social cognition; Theory of Mind; emotion recognition; executive function; co-occurrence; trans-diagnostic

1. Introduction

Humans navigate their social world by perceiving, interpreting, and responding to the signals of others: a glance, a tone of voice, a half-finished sentence. These abilities are collectively described as social cognition, the set of mental operations that underlie social interaction. Efficient social cognition supports friendships, family relationships, school and work functioning, and mental health. When it is disrupted, the consequences can include peer rejection, isolation, bullying, occupational difficulty, and elevated risk of anxiety and depression.

Autism spectrum disorder is a neurodevelopmental condition defined by persistent differences in social communication and interaction, together with restricted and repetitive patterns of behavior and interests. Social cognition has been at the heart of autism research for decades, beginning with the proposal that autistic children have difficulty representing the mental states of others (Baron-Cohen, Leslie, & Frith, 1985). Attention-deficit/hyperactivity disorder, by contrast, is defined by inattention, hyperactivity, and impulsivity. Social difficulties are not diagnostic criteria for ADHD, yet children and adults with ADHD frequently experience peer problems, conflict, and low social acceptance, and these difficulties are among the strongest predictors of poor long-term outcomes.

Two facts make a direct comparison of the conditions both necessary and difficult. First, the observable social behavior of the two groups can look similar: a child who interrupts, misses a joke, or fails to respond to a peer's distress may have ASD, ADHD, or both. Second, ASD and ADHD co-occur at high rates, and many existing diagnostic systems allow for the dual diagnosis of ADHD, so many In literature there are mixed or poorly characterized samples. Studies of social cognition are much more numerous and varied in ASD than in ADHD. In ADHD, social-cognitive results are frequently regarded as symptoms of more basic processes, and direct Comparisons between ASD and ADHD are still relatively few and diverse in method. As a

result, there is no comprehensive model of the intersection of the two conditions in social cognition in the field, When and how they diverge, and why.

This review addresses four questions:

1. What social-cognitive difficulties are reported in autism and in ADHD?
2. Which difficulties appear to be shared?
3.Which social-cognitive characteristics distinguish the two conditions?
4. What are the implications for diagnosis, assessment, and intervention?

Our central argument is that the more informative question is not whether both groups have social difficulties, which is well established, but whether similar difficulties are produced by the same mechanisms or by different cognitive pathways that converge on similar behavioral outcomes.

2. Conceptual Framework

What Is Social Cognition?

Social cognition is not a single ability but a family of interacting processes. For the purposes of in this review six domains are separated. Social attention, the allocation of attention to socially relevant information, faces, for example. Biological motion, and eye gazeprocessed by the social system. It is the entry point to social processing: information that is not attended to cannot be interpreted.

Emotion recognitioninvolves identifying emotional states from facial expressions, vocal prosody, body posture, and context. It is typically measured with photographs, video clips, or audio stimuli, and can range from basic emotions to complex, mixed, or context-dependent states.

Theory of Mind (ToM) is the ability to attribute mental states, such as beliefs, desires, intentions, and knowledge, to oneself and others and to use them to predict behavior. ToM ranges from early skills to advanced (understanding that another person may have a false belief) Skills (knowing when to recognize sarcasm, faux pas, or second order beliefs).

Empathyis often broken down into a cognitive part (understanding what another person feels), and an emotional part (feeling what that person feels). There are two kinds of feelings: an affective component (sharing, responding to another's state) and a cognitive component (reflecting on one's own feelings). The processing of components is partially separate and do not have to be impaired in unison.

Social perception refers to the understanding of interpersonal cues and situations such as: Aware of relationships, social norms and interaction dynamics.Attribution and interpretation is the way in which individuals try to explain what the intentions and actions of others are with biases like taking hostile action for unclear actions.These domains are best understood as a processing sequence rather than isolated modules. Attention to social cues feeds emotion recognition, which supports mental-state inference and empathy, which in turn shape interpretation of the situation and, ultimately, social behavior.

Figure 1

Conceptual Sequence of Social-Cognitive Processing



Note. The sequence is an organizing framework; the domains are interactive rather than strictly modular.

This sequence is important because it will be compared later. The disruption at any stage can affect the rest.Later on the disruption can hurt the rest. Not every poor performance on a downstream measure, like a ToM story task, automatically means a poor outcome, as it is possible for the measures to be poorly performed by itself.It indicate the occurrence of the problem in the sequence. A child can be incorrect for a mental-state inference task all forms of inference are inhibited because the relevant clue is never noticed, because working memory limitation meant that the story was not recorded; or, impulsive responding was so excessive that a considered answer was preempted. The analytical task of highlighting the difference between them is at the heart of the discipline. The review is framed by two further statements. Task performance is related to general cognitive factors, including IQ, language ability and executive function, which vary across and within diagnostic groups, and lab exercises, that are typically organized, timed, and without real-time social interactions. The demands of natural interaction may not be captured in pressure,

3. Social Cognitive Processing in Autism

3.1. Emotion Recognition

There is meta analytic evidence that, on average autistic people perform with lower accuracy on recognizing emotions from faces: moderate effect size compared with the non-autistic comparison group groups (Uljarević& Hamilton, 2013). It is challenging both in the way of voice and in multimodal. stimuli. It seems that performance is more impaired for more complex or less prototypical expressions. for tasks which involve immediate or situational decisions. Importantly, many autistic Simple tasks are performed within the typical range by participants and groups differ in their performance by sample IQ and by co-occurring alexithymia, which could be some emotion-related These were initially believed to be caused by autism (Bird & Cook, 2013). This raises the forgetting that some apparent emotion-recognition problems may be caused by a lack of recognition of the different emotions. Reflecting their own feelings not an underlying autistic process.

3.2. Theory of Mind and Mental-State Reasoning

ToM has been the most extensively studied domain in autism. Autistic children are, on average, delayed in passing standard false-belief tasks, and many show persistent difficulty with more advanced tasks such as recognizing faux pas, interpreting non-literal language, and inferring emotions from the eyes (Baron-Cohen et al., 1985; Baron-Cohen et al., 2001). Several qualifications are essential. Many autistic people, especially those with higher verbal ability, eventually pass basic false-belief tasks, sometimes through explicit, effortful reasoning rather than intuitive processing. Difficulties are therefore often more apparent in real-time, implicit, and open-ended situations than in structured tasks. In addition, the "double empathy" perspective argues that mutual misunderstanding between autistic and non-autistic people reflects a two-way mismatch in communication styles rather than a deficit located solely in the autistic person (Milton, 2012), which cautions against purely deficit-based framing.

3.3. Empathy

Autism is often described as involving an ‘empathy deficit’, but the literature supports a more differentiated picture. Autistic individuals frequently show reduced cognitive empathy, consistent with difficulty inferring others' mental states, whereas affective empathy is more variable and in many studies relatively preserved, and in some cases emotional responses to others' distress are intense. Self-reported difficulties may be inflated by alexithymia. Describing autism as a global lack of empathy is therefore inaccurate and potentially stigmatizing.

3.4. Social Attention and Perception

Atypical social attention is among the earliest observed features of autism. Eye-tracking studies report reduced orienting to faces, eyes, and social scenes, and reduced preference for biological motion, although effect sizes vary substantially across age, stimulus type, and task, and a meta-analysis found only a modest overall difference in attention to social stimuli (Chita-Tegmark, 2016). Atypical social orienting may reduce early learning opportunities, with cascading effects on later social-cognitive development (Mundy, 2018). Face-processing differences, including reduced holistic processing, have been reported but are inconsistent across studies.

3.5. Individual Differences

Autism is highly heterogeneous, and social-cognitive profiles vary with age, language level, intellectual ability, symptom severity, and sex or gender. Higher-functioning individuals may develop compensatory strategies, using explicit rules, scripts, and learned heuristics, that improve test performance while remaining cognitively costly and fragile under real-time demands. Autistic girls and women may camouflage social difficulties more frequently, which may mask differences in observed behavior and in diagnosis. Studies that pool participants across wide ranges of age and ability risk obscuring these differences.

4. Social Cognitive Processing in ADHD

4.1. Emotion Recognition

Meta-analytic work indicates that individuals with ADHD show reduced accuracy in emotion recognition compared with typically developing controls, with a small-to-moderate effect size, and the difficulty is evident across facial and vocal channels (Bora & Pantelis, 2016). Findings are less consistent than in ASD and may depend on task demands. Speeded tasks, tasks requiring sustained attention, and tasks involving subtle or complex emotions appear to elicit the largest differences (Uekermann et al., 2010).Some studies suggest a bias toward misreading emotions as negative or angry, which may be related to emotional dysregulation.

4.2 Theory of Mind

There is some evidence that mildly to moderately impaired ToM in ADHD, especially on more advanced tasks. such as faux pas recognition and interpreting complex stories, rather than on basic false-belief tasks (Bora & Pantelis, 2016). Performance seems to be sensitive to executive demands: if task demands keeping a few pieces of information in mind, or inhibiting an impulsive response, children with ADHD show greater difficulty. Several research studies indicate that group differences narrow when executive function or IQ is statistically controlled,

indicating that ToM impairments are related to those in executive function or IQ. Executive dysfunction may play a role in some of the symptoms.

4.3. Empathy

Research on empathy in ADHD is inconclusive. Some studies report decreased cognitive empathy, and affective empathy is intact, and sometimes enhanced, and emotional reactivity to others' states. A common clinical picture involves understanding that someone is upset but responding impulsively, interrupting, or being unable to regulate one's own emotional reaction long enough to respond appropriately. In this case the difficulty appears to lie less in representing the other person's state than in translating it into regulated behavior.

4.4. Social Perception and Interpretation of Social Information

Children with ADHD may be less accurate in encoding social cues, because they may miss or fail to process relevant details, and some studies report hostile attributional biases in ambiguous situations, particularly in those with co-occurring oppositional or conduct problems. Difficulties in pragmatic language, turn-taking, and monitoring conversational cues are frequently reported and may reflect inattention and impulsivity.

4.5. Primary Impairment or Secondary Consequence?

The central interpretive question in ADHD is whether social-cognitive difficulties reflect a primary impairment in social processing or a secondary consequence of executive and regulatory problems. Support for a secondary account comes from evidence that effects diminish when executive function is controlled, that stimulant medication can improve some social-cognitive performance, and that difficulties are most evident under high attentional load. Support for partially independent social-cognitive deficits comes from findings that some group differences persist after statistical control. A realistic position is that both pathways contribute, with their relative weight varying across individuals and ages. The practical consequence is that apparent ‘social cognition deficits’ in ADHD should not be assumed to be of the same kind as those in ASD.

5. Shared Social-Cognitive Deficits in Autism and ADHD

Direct comparisons suggest that both groups perform below typically developing peers on several measures. Bora and Pantelis (2016), who compared ADHD, ASD, and control groups, reported that both clinical groups showed impairments in emotion recognition and ToM relative to controls, with larger and more consistent impairments in ASD, particularly for ToM. This

pattern suggests comparable, but not identical results of different magnitudes. Common shared difficulties that are reported in the following areas: Recognize emotions especially complex or quickly presented emotions.

- Ability to take perspective in complex, open-ended, or multi-step tasks.
- Messages and expectations.Non-literal language, implicit messages, and expectations in complex social contexts. social rules.
- Social attention, although for different reasons.
- Actual interpersonal experiences such as peer rejection, problems with peers, and friends, conflict.

This common profile is not to be underestimated. Similar scores on a test do not suggest a common mechanism. The same level of errors on an emotion recognition task could be due to: In one participant it was reduced attention to eyes and in another participant it was decreased impulsive responding. The pattern of evidence is presented in the comparison table below, subject to the caveat being: a synthesis. must relate to overarching trends and not a claim against any particular individual and must be substantiated with evidence. studies finally included.

Comparison of Social-Cognitive Domains in Autism and ADHD

Table 1

Domain	Autism	ADHD	Shared / Distinct
Emotionrecognition	Often impaired; stronger for complex expressions	Variable impairment; sensitive to task demands	Partly shared
Theory of Mind	More consistently affected, especially advanced ToM	Mild and variable; related to executive load	Different magnitude and mechanism
Social attention	Atypical social orienting	Attention-regulation difficulties	Similar outcome, different

Domain	Autism	ADHD	Shared / Distinct mechanism
Cognitive empathy	Often reduced	Variable	Partial overlap
Affective empathy	Relatively preserved to variable	Variable; reactivity may be high	Heterogeneous in both
Social functioning	Difficulties common	Difficulties common	Shared outcome

Taken together, the data support convergence at the level of behavioral outcome and partial convergence at the level of task performance, but they do not by themselves establish convergence at the level of mechanism. That question is taken up in the next section.

6. Distinct Social-Cognitive Profiles and Underlying Mechanisms

A mechanism-oriented analysis suggests that the two conditions may reach similar social difficulties through different routes.

Autism: differences in the processing and interpretation of social information. In ASD, difficulties appear to be more strongly tied to how social information is represented and interpreted. Proposed accounts include reduced social motivation or orienting that limits early social learning (Chevallier et al., 2012), differences in intuitive mentalizing so that inferences must be made explicitly, and differences in predicting social outcomes. On these accounts, the difficulty lies in extracting implicit social meaning, such as intentions, irony, or unspoken norms, even when the relevant cues are attended to.

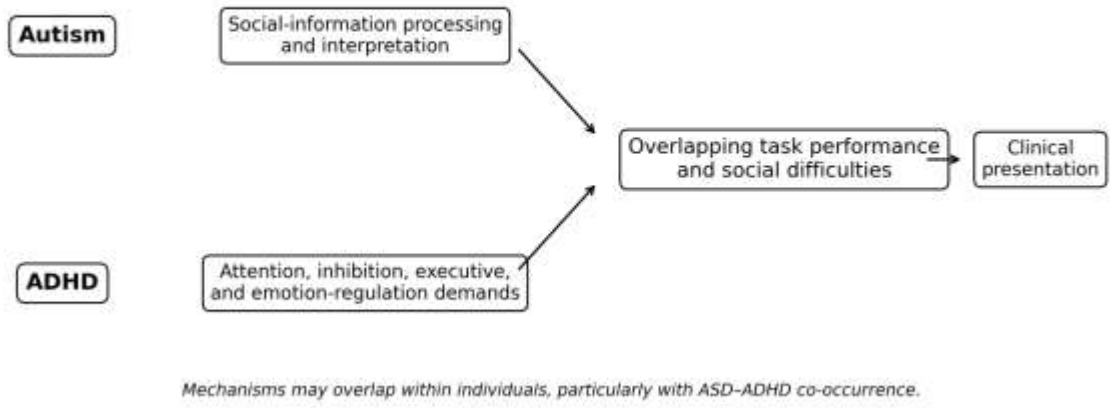
ADHD: attention regulation, inhibition, and emotion regulation. In ADHD, difficulties are more strongly associated with executive and regulatory processes. Reduced sustained attention may cause social cues to be missed, working-memory limitations may impair tracking of conversation, poor inhibitory control may lead to interrupting or responding before processing a situation, and emotional dysregulation may distort interpretation and reaction. On this account, the person often *can* interpret the situation when conditions allow, but cannot reliably do so in real time.

A concrete illustration is provided by difficulty following a conversation:

- Autism*:* the person attends to the speaker but struggles to infer the implicit meaning, such as sarcasm or an indirect request.
- ADHD*:* the person understands implicit meaning when the information is processed, but relevant social information is not sufficiently attended to or retained, or an impulsive response intervenes.

Figure 2

Distinct Cognitive Pathways Converging on Similar Social Outcomes



Note. The model represents a mechanism-oriented hypothesis, not a categorical separation of autism and ADHD.

Predictions that follow from this distinction are testable. If the executive account is correct for ADHD, social-cognitive performance should vary with attentional load, improve with scaffolding or medication, and show relationships with measures of executive function. If the processing account is correct for ASD, difficulties should persist when attention and executive demands are minimized and should be more strongly related to measures of social motivation and implicit mentalizing.

Table 2

Testable Predictions of the Distinct-Pathways Account

Mechanistic prediction	Autism	ADHD	Discriminating test
Sensitivity to executive load	Difficulties may persist	Performance should worsen	Manipulate attentional and

Mechanistic prediction	Autism	ADHD	Discriminating test
	when executive demands are minimized.	as attention or working-memory load increases.	working-memory demands within the same social-cognition task.
Effect of scaffolding	Explicit rules may improve performance but may not normalize intuitive or real-time processing.	Prompting, pacing, and cueing may substantially improve performance.	Compare supported versus unsupported task conditions.
Primary correlates	Social motivation, orienting, and implicit mentalizing may show stronger associations.	Executive function, inhibition, sustained attention, and emotion regulation may show stronger associations.	Model social and executive predictors simultaneously.
Real-time performance	Implicit meaning may remain difficult even when cues are attended to.	Knowledge may be present but inconsistently deployed in real time.	Contrast structured accuracy with time-pressured or naturalistic interaction.

Note. Predictions summarize the mechanism-oriented framework developed in Section 6 and should be treated as hypotheses for direct empirical testing.

Two cautions apply. First, the dichotomy is a useful organizing hypothesis rather than an established fact: executive-function difficulties are also common in autism, and social-orienting differences have been proposed in ADHD. Second, the mechanisms are not mutually exclusive, and the same individual may have both, which leads to the issue of co-occurrence.

7. ASD-ADHD Co-occurrence

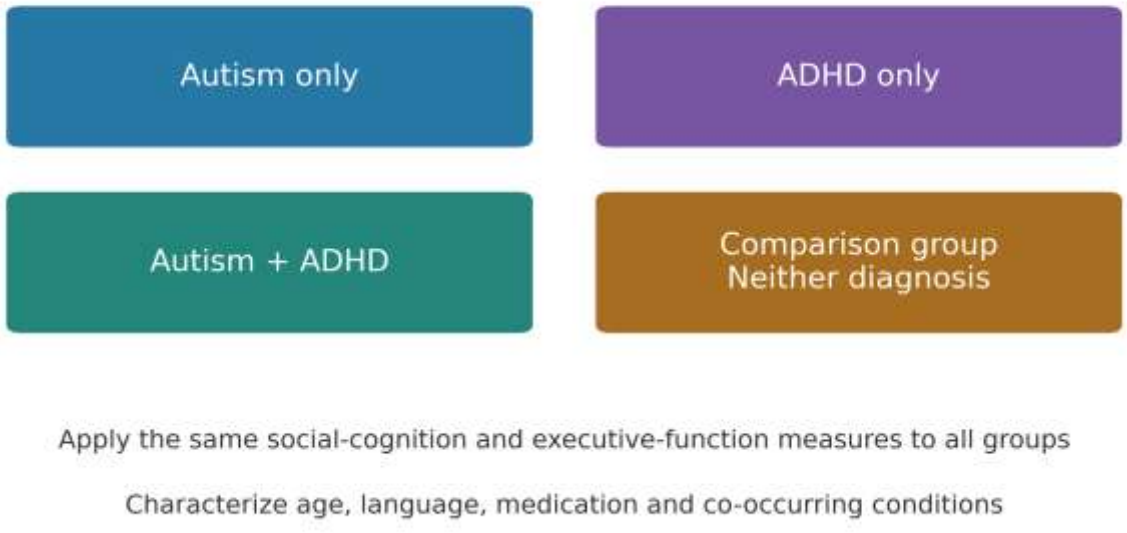
A significant number of autistic people also have ADHD and vice versa, as well as having some criteria that are shared. In clinical samples, the estimates of co-occurrence reach a significant percentage of samples. There is an established overlap between the genetic, neurocognitive and behavioral characteristics of ADHD (Rommelse et al., 2011). This co-occurrence makes it difficult to make an easy comparison between ASD and ADHD in at least three ways. ways. One, samples are contaminated. It can be helpful to keep in mind that a group in which everyone attends will include individuals who Participants with elevated autistic or ‘ADHD-only’ traits were classified as being ‘undiagnosed ADHD traits’ or ‘ADHD-only. observed similarities might be due to underlying comorbidity or common mechanisms, any differences noted may be

masked. Second, it's possible that combined presentations could be non-additive. People who have both conditions can exhibit a more severe and/or a qualitatively different social-cognitive profile than either condition alone. For instance, with decreased social attentions and impaired attention control, behavior, information about the additive or interactive nature or whether it is simply the average of the two remains limited. Thirdly, diagnostic practice has always been compartmentalized, with earlier diagnosis of conditions. Research was restricted to dual diagnosis; and previous studies frequently omitted one diagnosis if the other was present. was present. The resulting evidence base is not as representative of real clinical populations. The optimum design is thus four-group comparison

Autism and ADHD ↔ ASD + ADHD ↔ Typically developing controls. Such designs enable the question to be posed of whether the combined group is different from each other.Particular social-cognitive features follow one condition or the other or do they follow both. other. Or, dimensional approaches that assess autistic and ADHD symptoms at every point. Some of the issues associated with categorical grouping can be avoided across the population.

Figure 3

Four Group Design for Testing Shared and Distinct Mechanisms



Note. Conceptual research-design schematic based on Section 7. Colors distinguish study groups; they do not encode severity, prevalence or measured differences. Group comparisons require careful characterization and comparable assessment procedures.

8. Neurocognitive and Neurobiological Perspectives

Patients' evidence should be used with a grain of salt: results are variable, samples size is small. sizes are frequently small and brain behavior relationships are often not diagnosis-specific. With this provision, it is possible to compare two general types of systems mechanistically. One of these is the ‘social brain' network**,** involved in processing social information. It includes medial prefrontal cortex and temporoparietal junction (usually associated with mentalizing), the superior temporal sulcus (biological motion, gaze, and social perception), the fusiform face, and the amygdala (social cognition).The superior temporal sulcus (biological motion, gaze, and social perception), the fusiform face, and the amygdala (social cognition), amygdala (salience and emotional evaluation) and area. The brain's atypical activation or connectivity in there has been some evidence reported concerning these regions in issues of mentalizing and face-processing in autism, similar to a processing-based account, albeit with mixed reports per task and per sample (Kennedy &). Adolphs, 2012). The latter is the network of executive-attention (dorsolateral and) and regulatory networks (ventral attention).

The ventral-lateral prefrontal regions, anterior cingulate and front-parietal attention networks, fronto-striatal circuits. One of the most consistent alterations of function found in these networks is correlated with neurobiological abnormalities in ADHD, and it is associated with inhibitory control, sustained attention, and emotion regulation. The important thing is not that each condition "owns" one network, but that social cognition is based on both. Mentalizing needs social brain regions to make inferences and executive systems to maintain, select among, and act on them. Any disturbance in either set of systems can therefore have adverse effects on social behavior. This integrative view is compatible with the suggestion that convergent behavioral outcomes relate to various points of disruption, it is suggested that disorders are related to behavioral outcomes. may vary in the proportions of each system. It also encourages transdiagnostic neuroimaging social motivation, attention control and emotion Consistent regulation of diagnostic groups, consistent with the research domain criteria approaches.

9. Clinical Implications

9.1. Assessment

Social-cognitive measures can provide a description of the social nature of a person's problems in a way that is different than that provided by behavioral observations. That diagnosis is not enough to. A profile including performance on emotion recognition, mentalizing and attention-

related tasks, in addition to real-world and executive function. Social functioning, can show which processes are likely to be contributing to difficulties. Assessments should include tasks based on performance with parent, teacher, self and observational reporting with the scope of the laboratory tasks, measures. In addition to the above, alexithymia should be taken into account, Language, and IQ, which are factors that can affect the results.

9.2. Differential Diagnosis

Similar social issues may result from varying processes, which in turn, can present social problems. Should not be assumed to have the same cause. A kid that fails to participate in social activities. Because of inattention, cues might be required in a different way for a person with an intuitive and non-intuitive person. That is, someone might require both meaning and a person. Therefore, differential diagnosis should be based upon developmental history, nature and setting of social problems (e.g., if they are Stimuli (if there are limited/rigid/repetitive stimuli in both low and high demand contexts) and the behaviors and attentional/executive symptoms. Social-cognitive testing may inform but can't replace a thorough clinical assessment as nothing is enough to reliably do this. implements the discrimination of the two conditions at the individual level.

9.3. Intervention

A mechanism-oriented approach implies that interventions could be targeted to the probable source. of difficulty. Where the primary issue is interpreting social information, approaches that teach explicit mentalizing, emotion understanding, and social-communication skills, preferably in combination with It may be appropriate to practice in natural circumstances and in attention to generalization. Where the main problems are attention and control, as well as treating core ADHD symptoms (medications and behavioral interventions), executive-function assistance, and interventions to decrease the difficulties. The attention required for social interaction (prompting, real-time coaching) may be more. relevant. There is some evidence of transfer of social skills training to real life behavior, and some evidence of the opposite. This highlights the need for testing if mechanism matched interventions will work in these conditions. outperform generic ones.

For individuals with co-occurring ASD and ADHD, treatment of attentional and regulatory difficulties may improve a person's capacity to benefit from social-communication interventions, and clinicians should avoid assuming that treating one condition addresses the social difficulties

attributable to the other. Interventions should also respect neurodiversity-informed perspectives, aiming to support participation and well-being rather than eliminating differences in social style.

Table 4

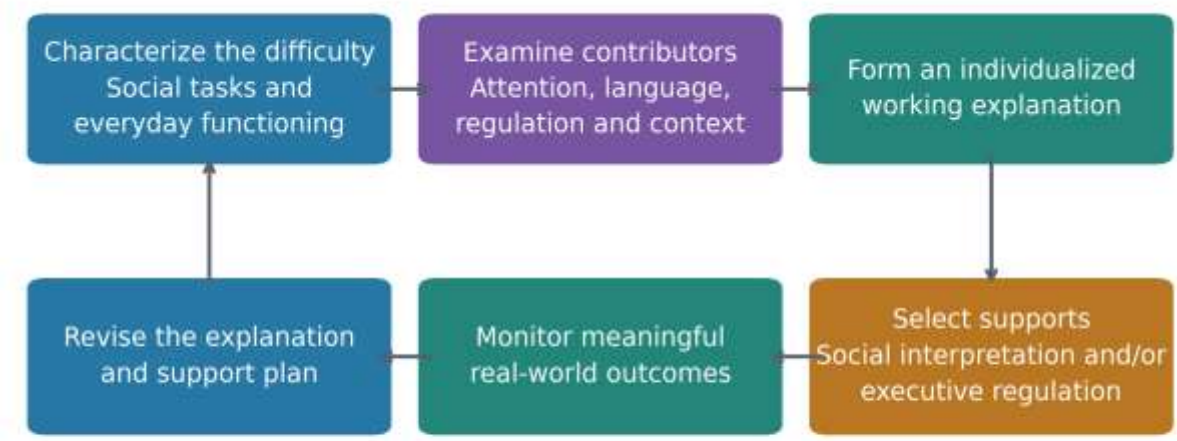
Mechanism-Informed Clinical Assessment and Intervention

Clinical domain	Assessment focus	Potential implication
Social-information processing	Emotion recognition, mental-state inference, and interpretation of implicit meaning	Consider explicit mentalizing, emotion-understanding, and social-communication supports.
Attention and executive regulation	Sustained attention, working memory, inhibition, and conversational monitoring	Reduce attentional load; use prompting, executive supports, and treatment of core ADHD symptoms where indicated.
Emotion regulation	Reactivity and regulation during interpersonal demands	Integrate regulation strategies with social-cognitive intervention.
Co-occurring ASD + ADHD	Profile both social-processing and executive-regulatory mechanisms	Use combined, individualized supports rather than assuming treatment of one condition resolves the other.
Real-world functioning	Reports, observation, and naturalistic measures	Do not infer everyday competence from a single laboratory task.

Note. Social-cognitive testing should supplement, not replace, comprehensive clinical evaluation.

Figure 5

Individualized Assessment and Support Cycle



Note. Conceptual illustration of the clinical framework in Section 9. This proposed cycle is not a validated treatment algorithm. Supports should reflect individual needs, context and preferences; no quantitative outcomes are shown.

10. Methodological Limitations and Research Gaps

The evidence base has several limitations that constrain firm conclusions.

- ✓ Heterogeneous and small samples. Many studies are underpowered and include broad age ranges, mixing developmental stages in which social cognition changes substantially.
- ✓ Task inconsistency. Studies use different tasks to measure supposedly the same construct, which impedes synthesis. Tasks also differ in their executive and verbal demands, making it difficult to isolate social-cognitive processing.
- ✓ Inconsistent definitions. Constructs such as empathy and ToM are operationalized differently across studies, and measures often confound social and general cognitive abilities.
- ✓ Medication. In ADHD, stimulant medication status may influence performance, and many studies do not control or report it adequately.
- ✓ Comorbidity. Insufficient characterization of co-occurring ADHD in ASD samples, and vice versa, as well as of anxiety, language disorder, and alexithymia, limits interpretation.

- ✓ IQ and language. Group differences in intellectual and verbal ability can account for some differences in task performance.
- ✓ Sex and gender. Samples are typically male-dominated, limiting generalization, especially given evidence of camouflaging and diagnostic bias in females.
- ✓ Ecological validity. A particularly important limitation is the gap between laboratory performance and real-world functioning. Poor accuracy on a laboratory emotion-recognition task is not necessarily equivalent to having the same difficulty in natural, dynamic interaction, where context, familiarity, and multimodal cues are available. Conversely, good laboratory performance, which may reflect compensatory strategies, does not guarantee competent real-time interaction.
- ✓ Cross-sectional designs. Most studies cannot address developmental trajectories or causal direction between social cognition, executive function, and social outcomes.

11. Future Research Directions

Progress will depend on designs that can adjudicate between shared and distinct mechanisms. Priorities include:

1. Direct comparisons of ASD, ADHD, co-occurring ASD+ADHD, and typically developing groups, with careful, standardized characterization of each.
2. Longitudinal studies that follow social-cognitive development, executive function, and social outcomes over time, to establish whether executive difficulties precede and shape social-cognitive difficulties in ADHD and whether social orienting differences precede them in ASD.
3. Ecologically valid assessment, including naturalistic interaction paradigms, virtual reality, and ambulatory or peer-based measures.
4. Multimodal measures, combining behavior, eye-tracking, physiological indices, and neuroimaging, to separate attention, perception, and inference.
5. Experimental manipulation of executive load, to test whether social-cognitive performance in each group is differentially sensitive to attention and working-memory demands.
6. Dimensional and trans diagnostic approaches, which examine traits across the population rather than relying solely on diagnostic labels.
7. Mechanism-focused intervention trials, testing whether matching treatment to the suspected source of difficulty improves outcomes.

A central question for the field is:

Future studies should determine whether apparently shared social-cognitive difficulties in autism and ADHD reflect common underlying mechanisms or distinct cognitive pathways leading to similar behavioral outcomes.

12. Conclusion

This review has argued that the relationship between autism and ADHD in social cognition is best described as overlap at the level of observable difficulty and partial divergence at the level of mechanism. Both conditions are associated with reduced performance on measures of emotion recognition, perspective-taking, and interpretation of complex social situations, and both are associated with real-world social problems. Yet the evidence suggests that these shared outcomes may arise from different processes. In autism, difficulties appear to reflect, to a greater extent, differences in how social information is processed and interpreted; in ADHD, they appear to be more strongly influenced by attentional, executive, and regulatory processes that affect whether and how social information is used in real time.

Several features of the literature temper this conclusion. The distinction is probabilistic rather than absolute, executive and social-processing differences occur in both conditions, high rates of co-occurrence blur group boundaries, and laboratory tasks may poorly reflect everyday social life. The framework presented here should therefore be treated as a hypothesis-generating model to be tested, rather than as a settled account.

The clinical significance is nonetheless considerable. Recognizing both overlap and distinction can improve assessment by shifting focus from whether a social difficulty is present to what is producing it, can sharpen differential diagnosis, and can support individualized, mechanism-informed intervention, including for the many individuals who have both conditions. Autism and ADHD may share observable difficulties in social functioning, but the cognitive mechanisms underlying these difficulties are not necessarily equivalent, and understanding that difference is likely to be the key to helping each person more effectively.

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