Trends
in Psychiatry and Psychotherapy

JOURNAL ARTICLE PRE-PROOF
(as accepted)

Review Article

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http://doi.org/10.47626/2237-6089-2026-1309

Original submitted Date: 27-Jan-2026

Accepted Date: 11-May-2026

Clinical Constructs and Historical Insights of the Autism Spectrum Disorder in adults

Short Title: Adult Autism: Clinical and Historical Constructs

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Abstract

Objective: Autism spectrum disorder (ASD) is clinically heterogeneous, and adult presentations, especially among individuals requiring Level 1 support, may be subtle,

shaped by adaptation, and obscured by comorbidity and diagnostic overshadowing. We review the historical evolution of autism-related constructs and their implications for recognising and interpreting ASD in adults.

Methods: We conducted a narrative review in MEDLINE (PubMed). Searches combined “autism”, “autism spectrum disorder”, and “ASD” with predefined constructs (central coherence, theory of mind, social skills, sensory processing differences, repetitive behaviours, restricted and intense interests, executive functions, alexithymia, sleep disturbances, motor abnormalities, and camouflaging). A second search focused on adult autism (adulthood, autistic adults, late diagnosis, and compensatory mechanisms). Grey literature was also considered; publications available up to December 2025 were included.

Results: The literature reflects a progressive refinement of the autism construct from descriptive behavioural syndromes to mechanism-oriented models that better accommodate phenotypic variability across development. In adults, these constructs help explain how pragmatic-communication difficulties, rigidity, intense interests, sensory reactivity, and executive-attentional differences can coexist with preserved language and intelligence. Recognition of compensatory strategies and social camouflaging helps explain delayed or missed diagnoses and associated distress. Shifts in diagnostic boundaries and awareness complicate inference from apparent prevalence increases.

Conclusion: A historically grounded, construct-based framework can improve recognition of clinically meaningful adult ASD, sharpen differential diagnosis amid comorbidity, and support nuanced interpretation of changing diagnostic practices and epidemiological findings. It may inform individualized assessment and support planning as occupational, relational, and adaptive demands increase across adulthood substantially.

Keywords: Autism spectrum disorder, adulthood, autistic adult, core symptoms, history of medicine

Introduction

Autism spectrum disorders (ASD) describe a constellation of conditions characterized by early impairment on reciprocal interaction and social communication, repetitive behaviours, commonly accompanied by delayed language milestones[1]. Although conceptualized as a single diagnostic category, the autism spectrum encompasses a

wide range of presentations and levels of impairment, as reflected in diverse developmental trajectories and support needs[2].

The first explicit clinical use of the term autism was articulated by Eugen Bleuler in 1911, who derived it from the Greek “autos” (self) to denote a pathological turning away from the external world toward an intensely self-referential ‘inner life’[3,4]. Within his description of schizophrenia, autism referred to patients’ profound detachment from shared reality, with markedly reduced interpersonal engagement and pronounced social withdrawal. Since then, its application has undergone several changes — from infantile autism in the third edition of the Diagnostic and Statistical Manual of Mental Disorders[5] to the recent formulation of the autism spectrum[1]. Thus, the concept has progressively transcended its original boundaries, ceasing to be regarded as an aspect of psychosis and becoming an independent construct.

The pioneering description of patients who would meet current diagnostic criteria for ASD was provided by Grunya Sukhareva in 1925[6]. In her seminal paper, she described a series of cases of “schizoid psychopathy in childhood”, comprising six individuals aged 10 to 14 years who were highly skilled in specific tasks, had intense and unusual interests, avoided other children, and exhibited marked sensory sensitivities. These patients also showed peculiar motor behaviour with marked motor impairment, psychasthenic mood, diminished facial mimicry and expressive movements, and characteristic abnormalities of voice and language. Sukhareva attributed this set of signs to developmental disturbances of specific brain systems, as these features had their onset in early childhood and could not be accounted for by the psychophysical changes of adolescence.

This original work has historically been cited less frequently than that of her successors, Leo Kanner and Hans Asperger[7,8], who became widely renowned for their detailed case descriptions and for characterizing autism as a distinct developmental condition rather than a subtype of psychosis. Taken together, these contributions provided an early conceptual framework for the current definition of ASD and its essential domains, considered its core-features. This underscored the diversity of presentations and trajectories across development and indicates that, although its core features may manifest differently at different ages, they must nonetheless be present from early development[1]. Kanner emphasized children with markedly atypical visual contact, profound social withdrawal, repetitive patterns of behaviour, and

intense reactions to sensory stimuli, whereas Asperger focused on cases with relatively preserved language and uneven intellectual abilities[7, 8].

The history of ASD holds important knowledge for clinical reasoning by providing context for its core features and refining distinctions between ASD and other conditions[9]. Tracing the evolution of the concepts in medical history contributes to clarification over changes in prevalence and interpretation of the epidemiological literature, also showing how the ASD constructs developed over time and why the spectrum is inherently heterogeneous[10]. The emergence of current diagnostic criteria relies on early clinical descriptions that provide information over the clinical presentation beyond diagnostic criteria. The description of the literature on how these concepts relate to ASD and how they manifest at the individual level can improve the quality of clinical assessment, as clinicians may better recognize a diverse range of clinical presentations[11].

Capturing this clinical heterogeneity, the Diagnostic and Statistical Manual of Mental Disorders [1] conceptualised three distinct levels of support in ASD: Level 1, requiring support; Level 2, requiring substantial support; and Level 3, requiring very substantial support. The first level, defined as “requiring support”, corresponds to individuals in whom autistic traits may be less evident yet remain clinically relevant. In this group, it is particularly important to deepen knowledge of ASD-related constructs, as core features are often attenuated and frequently occur alongside comorbidities.

Despite being present since infancy, autistic features may only become evident later in life, either due to learned strategies that mask them or when social demands exceed limited capacities [12]**.** Consequently, early diagnosis tends to be associated with higher impairment, which is more readily identified[13]. However, some individuals may remain undiagnosed because of their camouflage capacity[14], limited clinical recognition due to the lack of diagnostic assessment[15], and diagnostic overshadowing – leading to unrecognized significant impairment[16].

Although autism was described in childhood, early clinical reports already suggested persistence beyond the paediatric period.[7,8] Nevertheless, for much of the late twentieth century, research and care remained largely child-centred, reinforced by DSM-III’s “infantile autism” framing and the relative invisibility of adults outside institutional or non-specialist psychiatric pathways.[5] A distinct focus on adulthood became salient as the first clinically characterised cohorts aged into adult life and outcome studies began to document enduring functional disability and high rates of

unmet support needs, even among individuals without intellectual disability.[12] More recently, the spectrum model consolidated a lifespan formulation and legitimised adult ascertainment – including later diagnosis in individuals with preserved language and cognition – while shifting clinical priorities toward functional adaptation and the systematic recognition of psychiatric comorbidity and to impairments that dominate adult burden.[1,2,9]

A comprehensive understanding of autistic symptoms, their historical development, and the broader conceptual landscape of autism can support clinicians in more accurately recognizing and identifying autism spectrum disorder across heterogeneous presentations. Therefore, this narrative review aims to examine the historical evolution and the core features of Autism Spectrum Disorder. We examined the historical development of these constructs, including their origins, conceptual definitions, and subsequent application to Autism Spectrum Disorder, with the aim of clarifying how they have shaped the understanding of adult autistic presentations and informed contemporary clinical and research practices.

2. Methods

A narrative review of the literature was conducted using the MEDLINE (PubMed) database. In a first step, publications on autism spectrum conditions across the lifespan were identified using the terms “autism”, “autism spectrum disorder”, and “ASD” in combination with the following predefined constructs: central coherence, theory of mind, social skills, sensory abnormalities/sensory processing differences, repetitive behaviours, restricted and intense interests, executive functions, alexithymia, sleep disturbances, motor abnormalities, and camouflaging (social camouflaging of autistic traits). Preclinical and non-human studies (animal models, in vitro studies, and molecular-only models) were excluded. No age limits were imposed, and influential work in child and adolescent samples, including contributions by paediatricians and child psychiatrists, was retained when conceptually relevant. In a second step, a focused search on adult autism was performed using the terms “autism”, “autism spectrum disorder”, “ASD”, “adult”, “adulthood”, “adult autism”, “autistic adults”, “late diagnosis”, and “compensatory mechanisms”. In addition to peer-reviewed journal articles, non-journal sources were considered, particularly seminal books and monographs that have had a substantive impact on the scientific and clinical understanding of autism and these constructs in their historical context.

Sources were selected on the basis of conceptual and empirical relevance, without predefined eligibility criteria, given the narrative (rather than systematic) design. Publications available up to December 2025 were considered. In total, 109 peer-reviewed journal articles and 18 grey-literature sources were included.

3. Results and discussion

In adulthood, ASD may manifest as persistent difficulties in social communication and reciprocity, alongside restricted and repetitive patterns of behaviour, interests, and sensory alterations. These features may present subtly in individuals with preserved intellectual functioning and typical language development, as in the first level of support. Common manifestations include difficulties in the use of pragmatic language, reduced intuitive adherence to social conventions, rigidity in behaviour and cognition, intense interests, and atypical sensory reactivity[1]. These constitute the core features of ASD, as already described in early historical reports[7, 8], and may compose clinical presentations with varying intensities, underscoring the intrinsic heterogeneity of ASD[17].

Within this framework, a set of well-established constructs has been used to formalize and interrogate the core features of autism beyond their surface behavioural expression. Concepts such as central coherence, theory of mind, social skills, sensory processing differences, restricted and repetitive behaviours, intense interests, and executive and attentional functioning have served as organizing lenses through which ASD have been operationalised in the clinical and academical contexts.

1. Central coherence

The Central Coherence Theory refers to the integration of information at a global level, compelling individuals to prioritize understanding meaning, making sense of and seeing structure in information, fitting it into a broader context, thus distinguishing meaningful from meaningless material. Frith later developed this theory in depth, on the basis of an information-processing framework and of previous work on detail-focused cognitive style, field dependence–independence, and stimulus overselectivity[10,18], all derived from the information-processing framework in cognitive psychology[19, 20].

From Bartlett's classic work on remembering (1932)[21], she extracted the idea that individuals with ASD may have particular facility in tasks that require identifying

isolated details, thus recognizing a different pattern of information processing in this population. In parallel, Lovaas and Schreibman (1971)[22], and later Lovaas, Schreibman, Koegel, and Rehm (1971)[23], described stimulus overselectivity, in which behaviour comes under the control of only a restricted subset of elements within a complex sensory stimulus, leading to failure in the comprehensive assessment of that stimulus.

The Central Coherence Theory applied to the ASD results in the concept of Weak Central Coherence (WCC). The WCC theory postulates that ASD individuals have alterations in the expected central coherence, showing a detail-focused cognitive style, therefore leading information-processing to the primacy of detail over global meaning. For example, WCC becomes evident when autistic individuals are required to integrate multiple contextual elements to make sense of internal or external phenomena, a frequent demand in everyday life. Identifying the causes of phenomena, whether these are internal states or external events, generally requires integrating elements into a coherent whole.

Frith's seminal 1989 work already hypothesised a neurobiological substrate for weak central coherence[18]. fMRI evidence in ASD remains relatively limited; however, one study in autistic children reported reduced fronto–posterior connectivity during global-level processing (e.g., emotion identification), alongside altered coupling between body-perception and motor networks. By contrast, during local feature-based processing (e.g., shape identification), typically developing participants showed stronger recruitment of medial prefrontal and middle frontal regions implicated in executive control, consistent with greater top-down influence of global/social information[24].

2. Theory of mind

Theory of Mind (ToM) has been invoked in diverse contexts and its origins lie outside psychiatry. In 1769, Ferguson used the expression to refer to an understanding of the rules and laws governing nature[27]. Subsequently, the term acquired a new meaning within debates on monistic and dualistic views of the mind–brain relationship, becoming associated with internal mental phenomena rather than with the functioning of nature[28,29]. In 1978, Premack and Woodruff[25] introduced its contemporary sense as the capacity to impute mental states to oneself and to others, in their study with chimpanzees, "Does the chimpanzee have a theory of mind?". Seven years later,

Simon Baron-Cohen, Alan Leslie and Uta Frith paraphrased this formulation in “Does the autistic child have a ‘theory of mind’?”[26], a seminal paper that provided the first systematic application of ToM to the ASD population.

Baron-Cohen, Leslie and Frith extended the concept while retaining the label, proposing that ToM is secondary to the capacity to form second-order representations[30,31], which allow one to distinguish reality from other people’s mental representations and assumptions. When such representations are absent, individuals are unable to attribute mental states or to engage in pretend play, as they cannot ascribe ideas, emotions and intentions to others beyond concrete reality. In both pretend play and ToM, one must recognise that, although events unfold in a specific way, people may respond very differently depending on their personal characteristics, developmental history and perspective, including the particular subset of information to which they have access. Failures in this attribution lead to impaired social skills, which depend on a reasonably successful capacity for “mind reading”.

Baron-Cohen, Leslie and Frith (1985)[26] describe ToM as an underlying cognitive mechanism required for social skills, referring to the capacity to conceive mental states and to know that other people know, want, feel or believe things. In ASD, social impairment is thought to be largely explained by ToM impairment, which contributes to pervasive social challenges. Compromised second-order representations and ToM also help explain why autistic individuals with average or superior intellectual functioning may nonetheless lack pretend play and experience marked social difficulties.

In addition to cognitive rigidity, ToM impairment renders everyday social situations particularly demanding: to conform to typical social behaviour, one must be motivated to engage with others and their interests, form at least a partial representation of their internal states and make predictions about others, act in accordance with these inferences, and monitor one’s own social performance in order to compensate for, or apologise after, interpersonal failures.

High-functioning adults with ASD may present deficits in advanced ToM, such as understanding sarcasm and deception when these require sophisticated comprehension of others’ mental states and integration of contextual cues. Accordingly, depending on level of functioning, ToM impairment may become evident only in complex and socially demanding situations[32]. Capturing this complexity requires ecologically valid instruments and nuanced, multidimensional approaches[33].

ToM is closely related to empathy difficulties, since empathy is understood as a multidimensional construct with both affective and cognitive components[34]. However, ToM and empathy are not interchangeable constructs: ToM refers to the ability to represent and infer others' mental states (e.g., beliefs, intentions, and perspectives), whereas empathy refers to responses to others' affective states. Accordingly, cognitive empathy overlaps with ToM insofar as it requires mental-state attribution, but empathy also includes affective resonance (and related motivational responses) that are not captured by ToM[34].

In consequence of ToM's impairment, adults with ASD frequently show reduced cognitive empathy – that is, the capacity to infer and understand others' mental states and perspectives. Affective empathy, in contrast, often shows less impairment, as it refers to sharing and responding to others' emotions, akin to emotional contagion, particularly when others' affect is explicitly clear – for instance, when someone is crying[35].

3. Social skills

The study of social skills has deep and heterogeneous historical roots, which makes precise identification difficult. Concepts related to civilisation, the social contract and social organisation have been discussed since early Western philosophy and were later elaborated by sociologists, historians and political scientists[38, 39]. In psychiatry, Bleuler and Kraepelin described deficits in social interaction in schizophrenia. Bleuler used the term autism to denote marked social withdrawal, isolation and self-focused thinking, in keeping with the etymology of the word [3]. Subsequent work on social intelligence defined it as the capacity to understand the feelings, thoughts and behaviours of oneself and others and to regulate oneself accordingly[40]. The term social skills later emerged in the social-work literature to discuss interpersonal behavior[40], and was further developed when Sullivan became the first major researcher to place interpersonal behaviour at the center of his theory[41].

These contributions can be regarded as some of the early embryos of the contemporary concept of social skills. Argyris (1965)[36,42] defined social skills as interpersonal behaviours that enhance an individual's effectiveness as a member of an organisation. Other perspectives emerging around the same period decomposed social interaction to the level of motor skills[43]; emphasized behaviours that communicate understanding, interest and rapport with a speaker[44]; and behaviourist

approaches framed social skills largely as responses maintained by social reinforcement[37,45]. Consequently, social skills deficits came to be recognised as a clinically relevant dimension of psychopathology, with psychiatric patients increasingly having their social skills both assessed and targeted in intervention[46, 47].

The earliest references to what is now termed social skills in ASD can already be found in the original published case series, in which disturbances in social interaction were described as a defining feature of the condition. Beyond reduced social motivation, these children were consistently described as failing to respond to others, showing marked interpersonal difficulties and impaired social integration[7]. In the words of Sukhareva and Asperger, they appeared apathetic and unsociable, respectively[8, 48].

The definitions of social skills have undergone changes over time. Some formulations emphasise their function, namely enabling individuals to initiate and maintain relationships and to function within society[49]. Others define social skills as the abilities required for effective social communication and interaction, encompassing both verbal and nonverbal behaviours[50]. Social skills have become a central construct in the study of individuals on the autism spectrum, both because they are closely related to core features of ASD[51], such as impaired social cognition, and because they are frequently targeted in interventions, particularly in social skills training programmes [52,53,54].

Social skills therefore imply behaviours that help individuals achieve their goals, promote adaptation, and improve quality of life[55]. Among autistic adults, they may operate as protective coping strategies, reducing levels of stress and anxiety, by facilitating finding peers and developing genuine relationships[56,57]. They also support boundary setting and the resolution of interpersonal conflicts, increasing independence and autonomy in relationships[58].

Therefore, social skills training differs from camouflage, a phenomenon commonly studied in autistic individuals, although comparatively few studies have examined camouflage across different populations[59]. In autistic individuals, camouflage refers to the conscious or unconscious use of learned strategies to assimilate into the social environment[60]. Accordingly, the core distinction between social skills and camouflage lies in their function: social skills involve the authentic deployment of abilities to cope with social challenges[61], whereas camouflage involves hiding these challenges in an effort to appear “normal” and socially competent[62].

Unlike genuine social skills, camouflage often involves attempts to “blend into the crowd”[63] by suppressing autistic traits (masking), concealing difficulties through

prearranged scripts for how to act (compensation), and emulating typical behaviour (assimilation)[61]. Whereas camouflaging is a broader concept, masking refers to a facet of camouflage centred on suppressing autistic traits. Therefore, compared with most non-autistic individuals, autistic people are more likely to experience a mismatch between their way of being and social demands[61]. As a result, higher levels of camouflage have been associated with greater social and generalised anxiety symptoms, increased depressive symptoms, and lower self-esteem[64,65,66].

4. Sensory abnormalities / sensory processing differences

Accounts of sensory alterations date back to Greek scholarship, in which anaesthesia was used to denote philosophical blunted perception, and later entered medical usage – already in Hippocratic Corpus (Corpus Hippocraticum) – to describe a pathological loss of sensation[67]. Notably, later work in the primordiums of neurology documented disturbances in sensation, as in Julien Offray de La Mettrie's case of unilateral hemianesthesia and fluctuating non-anatomical sensory deficits, in 1738[68]. Charcot later formalised such sensory disturbances as characteristic features of hysteria[69].

In Clinique des maladies du système nerveux (1893, vol. 2), Charcot presents a heterogeneous series of cases and refers to "perte du sens musculaire". He also describes a young woman with delusions and hallucinations. She exhibited a phase of "attitudes passionelles" under the "influence des excitations sensorielles", followed by seizures. Charcot further discusses "hémianesthésie sensitivo-sensorielle hystérique" in patients presenting alterations in mood, reality testing, sense perception, and thought[69]. Sensory alterations remained a focus of discussion in neurology and psychiatry, both in the presence and in the absence of neurological signs[70,71].

Sensory alterations were described in the original case series of patients with ASD. Sensory abnormalities, including hypersensitivity, hyposensitivity, and reduced or absent sensitivity, are also highly prevalent in autistic adults. These abnormalities may occur across multiple sensory modalities, including vision, hearing, touch, taste, smell, balance, and proprioception. There is considerable heterogeneity in both the type and severity of sensory experiences across individuals[71].

Pain perception represents a clinically important extension of this sensory heterogeneity in ASD. Experimental and clinical evidence indicates that autism spectrum disorder is not uniformly associated with pain hyposensitivity. Although early

reports described reduced behavioural reactivity, quantitative sensory and neurophysiological studies show highly variable pain responses, including typical thresholds and, in some individuals, hypersensitivity. Because pain expression may be atypical or muted despite physiological reactivity, clinicians should avoid assuming diminished pain perception and instead perform individualized assessment[72].

In autistic adults, sensory processing differences are associated with both internalising problems (such as anxiety and depression) and externalising problems (in example, aggression and impulsivity). Hypersensitivity, particularly in visual, auditory, and tactile domains, has been strongly linked to these mental health difficulties. By contrast, sensation seeking appears to be more closely related to externalising behaviours[73].

5. Repetitive behaviours

The historical roots of repetitive behaviour remit to early work on psychomotor phenomena[74]. Joseph Guislain in 1835, first distinguished immobility, rigidity, and behavioural oddities[75]. Falret later coined the term “stereotypy” to describe the persistence of illness after a certain stage of delusions, when no new symptomatology emerged[76]. In 1874, Karl Ludwig Kahlbaum described catatonia, stereotyped and repetitive movements. In 1877, Carl Westphal provided an early clinical description of compulsive and repetitive phenomena within what would later be conceptualised as obsessive-compulsive psychopathology[77]. In 1895, Neisser referred to the pathological persistence of mental or motor acts as perseveration[78].

These roots later expanded into a vast literature addressing repetitive actions of multiple natures. Repetitive behaviours are a prominent clinical feature across various psychiatric disorders, including Tourette syndrome, persistent tic disorders, obsessive-compulsive disorder, and ASD. Although these manifestations may appear superficially similar across conditions, they are thought to reflect distinct neurobiological substrates[79] – therefore, requiring distinct treatment interventions in both pharmacological treatment and psychotherapy[80,81].

Restricted and repetitive behaviours in ASD can include motor stereotypies, immediate or delayed echolalia, insistence on sameness, and ritualised patterns of behaviour[1]. In adults, these features may be directly observable or partially obscured through camouflage[65]. It is important to note that autistic girls and women often present fewer repetitive behaviours than boys and men, which can further complicate the clinical recognition of ASD[14]. This increases the complexity of clinical evaluation and

underscores the need for careful assessment of developmental history, including the possibility that overt stimming has been replaced by more subtle behaviours[65]. Ritualised chains of behaviour may indicate rigid adherence to routines. Motor stereotypies, such as hand flapping, rocking, finger flicking, and pacing, may only become apparent when the individual is alone. Such stereotypies are typically rhythmic and may involve the whole body or specific body parts. These repetitive behaviours often serve as self-soothing coping strategies, employed to manage sensory overload and reduce anxiety[82].

Circumscribed interests are a core feature of ASD and are characterised by an intense, focused engagement with a narrow range of subjects, being a subcategory of repetitive behaviours. Individuals with ASD frequently plan their activities rigidly around these interests[83]. Although these interests may serve a self-soothing function, as pleasurable and often predictable activities, they may also preclude the development of alternative coping strategies and impair self-regulation. Overreliance on these activities can reduce flexibility and increase distress when they cannot be performed[84].

6. Intense interests

There are multiple origins for the current understanding of restricted and intense interests. In 1801, Philippe Pinel discussed restriction of thought content in partial insanity[85]. Later, Esquirol formalised “monomania” as a condition driven by an obsessive idea or impulse – namely, a fixed idea[86]. These early descriptions arose in the context of psychosis and largely referred to delusional phenomena in otherwise partially preserved individuals. In 1925, Sukhareva’s cases of “schizoid psychopathy” were also characterised by strong and specific interests[6].

Rigid and intense interests are a consolidated concept in psychopathology, already present in early psychiatric descriptions and reported across several diagnoses. Psychotic disorders may markedly narrow the focus of thought[87], while intense interests are also described in neurodevelopmental disorders[88], hyperthymic mood episodes[89], and disorders with obsessive-compulsive features, such as obsessive-compulsive disorder[90] and eating disorders[91]. Therefore, a substantial literature across varied populations has been dedicated to describing restricted and intense interests.

From its seminal descriptions, ASD has been notably characterised by intense and restricted interests [7,34,71]. These accounts ranged from unusual interests – such as one

of Sukhareva's patients who, at age 13, reacted with euphoria to reports of illness or death – to interests that were age-expected in content, but pursued with uncommon intensity and frequency[71].

In apparent contradiction to the formulation of restricted interests, studies in high-functioning autistic adults found that their interests were more intense, but not more limited in scope or number, than those of control individuals. Areas of interest differed by gender in both the autistic and control groups, and higher interest intensity was positively correlated with greater ASD symptoms and impairment. Rather than presenting a reduced range of interests, they showed greater intensity, and their areas of interest were less likely to be socially oriented or to require interpersonal interaction, therefore endorsing the need to separately evaluate repetitive behaviours and intense interests[83, 92].

These interests vary across sociodemographic variables, such as age and gender. Studies in children with Asperger syndrome and ASD reported significantly higher interest in folk physics, television and audio, and lower interest in folk psychology among children on the spectrum[88]. Classical examples of intense interest in the literature often include dinosaurs, computers, videogames, hardware, transport systems and trains, which are more frequently reported in samples dominated by male children[93].

When intense interests are used as illustrative examples more broadly, the gender bias associated with historically higher rates of autism diagnosis in males than in females – dating back to the original case series – often persists. Thus, it is relevant to differentiate that intense interests among girls and women frequently involve people and animals rather than objects, possibly due to socialization reasons[15]. Studies have reported examples including animals, soap operas, celebrities, pop music, fashion, horses, pets, literature, stickers, pens, rocks, among others[94]. Consequently, autistic girls and women may not present the content of narrow interests that is often portrayed as "typically autistic", which can contribute to underdiagnosis[95].

7. Executive functions / executive functioning and attention

Executive functions are an umbrella concept that emerged from the work of multiple independent researchers who identified, named, and studied its component processes[96]. The term was credited to Muriel Lezak (1982), although Karl Pribram (1973) had cited executive functions in reference to his understanding as frontal-lobe

functions involved in behavioural organisation[97]. Muriel Lezak conceptualized "executive functions" as the capacities to formulate goals, plan, and carry out plans effectively (1982)[98]. These formulations helped systematise ideas that had been developing throughout mid-twentieth-century research, including Berg's measurement of cognitive flexibility (1948), Broadbent's work on attention (1958), and Luria's account of higher cortical functions (originally 1962; English translation 1966)[97].

Executive functions are often discussed as a set of commonly cited components; however, the scientific literature lacks consensus on which concepts should be unequivocally classified as executive functions[96]. These higher-order functions are commonly listed as inhibition and interference control, working memory, and cognitive flexibility. Some authors argue that executive control relates specifically to inhibitory control of attention, enabling selective attention through suppression of concurrent stimuli, rather than encompassing attention in all its forms. In the present section, we nonetheless include attention in order to address attentional alterations in ASD, which are closely related to its core symptoms.

Inhibitory control: in general, it is the capacity to inhibit a dominant response or impulse. It may manifest as self-control, that is, control over internal impulses and temptations. It may also manifest as control of interference, namely interference control, which involves selective attention and cognitive inhibition[96]. In ASD, there is often difficulty suppressing behavioural responses that interfere with goal attainment and ignoring irrelevant stimuli. Distraction may arise from orienting to external objects or from internally generated stimuli related to one's own interests[99].

Attention: comprises mechanisms that select, modulate, and monitor stimuli over extended periods of time within a limited capacity. These mechanisms are commonly divided into more specific categories in order to discriminate between distinct difficulties and their underlying neurobiological networks. Accordingly, attention is often decomposed into four types: selective, focused, diffuse, and joint attention[100].

Selective attention is the cognitive process of prioritising relevant stimuli or sensory information while actively inhibiting irrelevant or distracting input[101]. Individuals with ASD often present impairments in selective attention, with difficulty differentiating irrelevant from relevant information, and allocating attention to stimuli that are useful for their goals. This may relate to weak central coherence, which is associated with a detail-focused cognitive style and the primacy of local detail over global meaning.

Clinically, this can be reflected in lengthy, highly detailed verbal reports to convey a simple point or describe a straightforward event [102].

Focused attention refers to the sustained allocation of cognitive resources to a single object over time [103]. Adults with ASD commonly face challenges in sustaining focused attention over extended periods when the target stimulus falls outside the range of their intense interests. Cognitive rigidity may further contribute to a tendency to return to preferred stimuli and interests, resulting in increased distractibility and, at times, reduced performance [104].

Diffuse attention denotes a broader distribution of attentional resources across the environment, spanning multiple stimuli[105]. Given the frequent presence of a detail-focused cognitive style in autistic individuals, sustaining vigilance while modulating attention across multiple objects may be particularly difficult. They may struggle to narrow or shift focus, reflecting both sensory overload and difficulties in prioritisation[106].

Joint attention is a key concept in the understanding of ASD. It refers to a shared focus of two or more individuals on the same object or event, typically expressed through gaze and verbal and non-verbal communication[107]. Therefore, impairment in joint attention can exacerbate social skills challenges, as individuals may be less likely to integrate, contextualise, and sustain attention to interpersonal information. Low social motivation may further intensify weak joint attention, contributing to reduced visual contact and diminished sensitivity to social cues that are not explicit. This profile also intersects with cognitive rigidity and with difficulties in considering alternative meanings of stimuli and attributing mental states to others, as in theory of mind. Consequently, shared interests may be less readily established, as interests may centre on non-social activities and individuals may be less motivated to attend to others' interests and cues[108].

Working memory: holding information in mind to mentally operate it, even when the information is no longer perceptually available[96]. Working memory's capacity might be reduced under high cognitive load and when active and strategic allocation of cognitive resources is required[109].

Cognitive flexibility: the capacity to change perspectives and adjust to new context, demands, and priorities, such as switching between tasks or dealing with the unforeseen. It is related to creativity, as it allows one to "think outside the box" and manipulate information in novel ways[96]. Cognitive flexibility is reduced, leading to

challenges over shifting tasks, dealing with novelty and thus adapting to change, which relates to core ASD symptoms[99].

8. Synthesis

Thus far, we have addressed the symptom domains that define ASD, together with closely related constructs, in order to clarify their origins and their contemporary use in the autism spectrum, especially in adults. Table 1 summarises each concept, its original proponents or key authors across history, the current definition, and its application to ASD.

Concept	Original proponents	Concept description	Application in ASD
Central coherence	Uta Frith (1989)	Central coherence refers to the cognitive tendency to integrate information into a coherent whole, prioritizing global meaning and contextual relationships over isolated details. It supports efficient interpretation of complex stimuli by extracting overarching structure and relevance.	Central coherence is often altered, giving rise to the formulation of Weak Central Coherence. Autistic adults tend to process information in a detail-focused manner, with reduced spontaneous integration of contextual cues. This contributes to difficulties in grasping implicit meaning, contextualized social information, and causal relationships in everyday situations, despite strengths in detail-oriented tasks.
Theory of mind (ToM)	Premack & Woodruff (1978); Baron-Cohen, Leslie & Frith (1985)	Theory of mind denotes the capacity to attribute mental states to oneself and others and to understand that these states may differ from objective reality. It relies on second-order representations that allow reasoning about beliefs, intentions, emotions, and perspectives.	ToM impairments contribute to persistent difficulties in social reciprocity and perspective-taking. In adults, deficits are often subtle and become evident in socially complex or ambiguous contexts, such as irony, sarcasm, deception, or indirect communication, leading to interpersonal misunderstandings despite preserved intellectual abilities.
Social skills	Argyris (1965); Libet & Lewinsohn (1973)	Social skills encompass behaviors that enable effective social communication, interpersonal effectiveness, and adaptive participation in social contexts. They include verbal and nonverbal	Social skills difficulties are central to ASD and present from early descriptions of the condition. In autistic adults, impairments may involve pragmatic language difficulties, reduced intuitive understanding of social conventions,

		behaviors that facilitate relationship initiation, maintenance, and conflict resolution.	and challenges in reciprocal interaction. Acquired social skills may function as adaptive coping strategies and improve quality of life, but must be distinguished from social camouflaging, which is associated with increased psychological distress.
Sensory abnormalities / sensory processing differences	Hippocrates (c. 460–380 BCE); Charcot (1887–1893)	Sensory abnormalities refer to altered perception, modulation, or integration of sensory input, including hypersensitivity, hyposensitivity, or atypical sensory responsiveness across modalities. These phenomena have longstanding roots in medical and psychiatric descriptions.	Sensory processing differences are highly prevalent and heterogeneous, affecting multiple sensory systems. In adults, sensory hypersensitivity is strongly associated with anxiety, depression, and emotional dysregulation, while sensation-seeking behaviors may relate to externalizing symptoms. Sensory overload frequently exacerbates social, occupational, and adaptive difficulties.
Repetitive behaviours	Guislain (1835); Falret (1868); Kahlbaum (1874); Sukhareva (1925); Kanner (1943); Asperger (1944)	Repetitive behaviours include stereotyped movements, ritualized actions, perseveration, and insistence on sameness. Historically linked to psychomotor and obsessive phenomena, they are described across several psychiatric conditions.	Repetitive behaviours range from overt motor stereotypies to subtle, partially camouflaged routines in adulthood. These behaviours often serve self-regulatory and anxiety-reducing functions. In adults—particularly women—overt manifestations may be minimized or replaced by less visible patterns, complicating clinical recognition and requiring careful developmental assessment.
Intense interests	Philippe Pinel (1801)	Intense interests involve a disproportionate focus on specific themes or activities, characterized by high intensity and persistence. Historically described as fixed or dominant ideas within psychopathology.	In autistic adults within the first support level, interests are often not fewer in number but markedly more intense and absorbing, frequently oriented toward non-social domains. While they may provide pleasure and emotional regulation, excessive reliance on these interests can reduce flexibility, interfere with functioning, and increase distress when access is restricted.

Executive functions and attention	Karl Pribram (1973); Muriel Lezak (1982)	Executive functions comprise higher-order cognitive processes involved in goal formulation, planning, inhibition, working memory, cognitive flexibility, and attentional control. Attention includes mechanisms for selecting, sustaining, shifting, and sharing focus across stimuli.	Executive dysfunction contributes to rigidity, difficulties with planning, and reduced cognitive flexibility. Clinically, impairments in joint attention are particularly salient, exacerbating social communication difficulties. Attentional resources may be disproportionately captured by intense interests, interfering with goal-directed behavior, social engagement, and adaptation to changing environmental demands in adulthood.

9. Other clinical presentations

Beyond these, other relevant concepts frequently emerge in the clinical setting when assessing autistic adults, often reflected in presenting complaints and self-reports. Therefore, the present section aims to discuss additional concepts and their manifestation in common clinical presentations of adults with ASD.

Adults with ASD frequently exhibit multiple layers of clinical difficulties, including substance abuse[110], mood episodes[111], and challenges in meeting developmental milestones expected in adulthood. These may involve forming and maintaining diverse social relationships – such as romantic partnerships, attaining occupational stability, and achieving financial and functional independence[112]. Alterations in circadian rhythms, such as persistent sleep disturbances not attributable to mood episodes and late-night alertness associated with intense, restricted interests, are also common[113].

It is well documented that ASD often presents with sleep and motor alterations, as well as alexithymia. In adults with ASD, it is not unusual to observe circadian inversion, with individuals sleeping late or, in some cases, fully inverting their sleep schedule and remaining awake at night. Several factors may contribute to this phenomenon. Daytime routines often entail greater sensory stimulation, increasing the likelihood of sensory overload. They also involve more frequent social interaction and higher social demands on social skills [113, 114].

Motor alterations in ASD extend beyond restricted and repetitive movements, such as stereotypies. Gait alterations, atypical posture, and unusual body positioning are commonly reported. In adults, these motor features may present as dyspraxia and stiff, poorly fluid, or mechanically patterned gait and movement, with limited motor

adaptability across contexts [115, 116]. Even the seminal descriptions of ASD referred to patients as “clumsy” and as having poor fine motor coordination, as already noted in Sukhareva’s first paper[6].

Alexithymia is defined as difficulty identifying and naming emotions, as its etymology indicates: *a-* (absence), *lexis* (words or vocabulary), and *thymo* (mood and feelings). Autistic individuals frequently present alexithymia, with challenges in perceiving and labelling their emotional states. This may occur because emotions operate as a whole-body response system and require the integration of multiple internal and external events[117]. Such integration involves antecedents (i.e., potential triggers) as well as thoughts, bodily sensations, and action impulses, in order to recognise this set of stimuli as a discrete emotional state. This process is cognitively demanding and depends on the integration of the previously discussed constructs within a coherent cognitive system. In ASD, where these processes are often impaired, alexithymia may emerge and, consequently, compromise emotion regulation[118].

Emotion dysregulation is common among autistic adults. It often emerges when their expectations are unmet, further contributing to clinical complexity[15]. Irritability is also highly prevalent, with rates reported around 80% in childhood. Irritability is closely related to emotion regulation, which is frequently impaired in ASD. These emotional difficulties likely increase vulnerability to comorbid conditions, including anxiety, mood, and substance use disorders[119]. Across development, irritability tends to decrease, particularly among individuals with higher verbal and non-verbal cognitive ability in childhood. Higher verbal and non-verbal ability also predict greater improvement in irritability in pre-adolescence and late adolescence, respectively[120].

Therefore, cognitive ability is an important prognostic predictor. Intelligence is heterogeneous among individuals with ASD[2], although a higher intelligence quotient is generally associated with better outcomes in adult life[13]. Even so, autonomy is often limited. Only a fraction of adults with ASD live independently, with many remaining with their family into midlife. Functional outcomes and, consequently, autonomy are also reduced among individuals with comorbidities and compromised intellectual ability[121]. Adults with ASD are also frequently underemployed or unemployed, even when cognitively able, due to adaptive challenges[122].

The complex interplay between ASD core features and adult life gives rise to multiple layers of clinical issues that are often under-recognised and overlooked, particularly when individuals present a highly impairing comorbidity, such as substance use

disorder. The recognition of ASD in adulthood is influenced by multiple variables[123]. Adult presentations differ from traditional descriptions because learned compensatory strategies modify the expression of characteristic behaviours[124]. The identification of ASD in adulthood may be further complicated by comorbidities and secondary mental health conditions arising from insufficient support and intervention, which increase overall psychological vulnerability[125].

The distinct pathways leading individuals to clinical settings are shaped by reciprocal influences between neurodevelopmental characteristics and comorbidities[16]. The interplay among neurodevelopment, environmental factors, and psychopathological processes — compounded by evolving comorbidities — gives rise to complex clinical presentations. In such cases, diagnostic overshadowing may obfuscate the neurodevelopmental challenges that underlie longstanding difficulties in adaptation. Beyond classic features and clinical descriptions, ASD is profoundly heterogeneous and susceptible to distinct presentations, shaped by varied patterns of socialisation and environmental context. Accordingly, adults with higher cognitive ability and camouflage strategies may not be considered for ASD assessment, despite substantial clinical impairment [126, 127].

Conclusion

The present narrative review examined autism spectrum disorder (ASD) through a historical and conceptual lens, with particular emphasis on adult presentations and on the evolution of the constructs that currently underpin its diagnosis and clinical understanding. When considered as a whole, the literature reviewed illustrates a progressive refinement of the autism construct rather than abrupt conceptual discontinuities, reflecting cumulative advances in psychiatry, developmental psychology, and neuroscience[10]. The contemporary notion of ASD as a spectrum represents a major scientific advance, allowing increasing fidelity in capturing clinical heterogeneity across individuals and across the lifespan[2,11].

A central strength of the current conceptualization lies in its departure from rigid categorical models toward a dimensional understanding of neurodevelopmental diversity. Early clinical descriptions already pointed to variability in presentation, but contemporary frameworks explicitly acknowledge that autism encompasses a broad range of phenotypes, developmental trajectories, and levels of functional impact[7,8,10]. This shift is consistent with empirical evidence demonstrating marked variability in

cognitive functioning, adaptive skills, sensory processing, and social cognition, even among individuals who meet identical diagnostic criteria[1,2].

The incorporation of cognitive and neuropsychological constructs—such as central coherence, theory of mind, executive functioning, and sensory processing differences—has substantially deepened explanatory models of ASD[10,11]. These constructs allow clinicians and researchers to move beyond surface-level behavioral descriptions and to better understand mechanisms underlying social communication difficulties, rigidity, and atypical perceptual experiences. In adulthood, where presentations may be subtle and shaped by years of adaptation and compensation, this conceptual depth is particularly relevant, supporting more accurate recognition of clinically meaningful impairment[12,15].

The spectrum framework has also refined the understanding of severity. Rather than implying a unidimensional gradient from “mild” to “severe,” current models emphasize multidimensional configurations of strengths, vulnerabilities, and support needs[1]. Functional impact varies across domains and contexts, and difficulties may become more salient as environmental and social demands increase. This perspective is especially important in adult ASD, where challenges frequently emerge in occupational, relational, and adaptive domains rather than through overt developmental delays[11–13].

Recognition of compensatory strategies and social camouflaging further illustrates the maturation of the field. These phenomena help explain delayed or missed diagnoses and underscore the limitations of relying exclusively on observable behavior during brief clinical encounters[15,59–61]. Importantly, camouflaging has been associated with increased psychological distress, anxiety, and depressive symptoms, reinforcing the need to distinguish adaptive skill acquisition from efforts to suppress or mask neurodevelopmental differences[62–66].

At the same time, the evolution of diagnostic criteria introduces important interpretative challenges. Expanded diagnostic boundaries, improved awareness, and reduced diagnostic overshadowing contribute to the perception of increasing ASD prevalence[10,11]. These trends must be interpreted cautiously, as they may largely reflect changes in classification and detection rather than true increases in incidence. Without careful historical contextualization, epidemiological findings risk being oversimplified or misinterpreted.

Historical perspective is therefore not merely descriptive but epistemologically essential. Understanding how autism-related constructs emerged and evolved clarifies why heterogeneity is intrinsic to the spectrum and how diagnostic criteria shape both clinical practice and population-level data[9,10]. This perspective supports critical engagement with current frameworks while acknowledging their empirical grounding. Taken together, the conceptual evolution of ASD reflects a progressive alignment between clinical observation and scientific evidence. The spectrum model accommodates diversity, enhances clinical sensitivity, and supports individualized assessment across adulthood. While ongoing refinement of diagnostic criteria will inevitably generate debate and complexity, a historically informed and conceptually grounded approach remains fundamental for advancing research, improving clinical care, and applying the autism spectrum construct with precision and nuance.

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Handling Editor: Carmem Gottfried

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