Title

ENSORY PRECISION AND WORKING MEMORY VARIABILITY IN AUTISM SPECTRUM DISORDER

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SENSORY PRECISION AND WORKING MEMORY VARIABILITY IN AUTISM SPECTRUM DISORDER

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ABSTRACT

Autism Spectrum Disorder (ASD) affects cognitive processing in ways that challenge conventional models of human cognition. Previous studies have shown contradictory findings regarding the specific impacts on working and sensory memory. By examining autistic traits along with psychiatric comorbidities, this study seeks to bridge this gap. To gain a deeper understanding of the distinct neural and behavioral mechanisms that underlie the cognitive functions and memory precision of individuals with Autism Spectrum Disorder (ASD), this study utilized a quantitative approach.

To evaluate sensory memory precision, the study will modify Zhang & Luck's (2008) color wheel paradigm. In addition to verbal and visuospatial working memory exercises, participants will complete executive function tests that assess cognitive flexibility. The study displayed evidence that higher scores on the ASQ correlate with higher sensory memory precision and categorical encoding, no associations with working memory, and strong correlations with psychiatric comorbidities.

This research makes significant contributions to theoretical models and real-world applications by deepening our understanding of the cognitive processes involved in ASD. The results of this study have contributed to the continuous research done regarding ASD and autistic traits to help understand the link between cognitive functioning and the prevalence of such traits.

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Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition that results in variations in perception, memory, and cognitive functioning. Many research studies have examined cognitive performance in humans with ASD; however, the findings have often been contradictory. Some studies suggest perceptual strengths or unusually precise sensory processing, while others report difficulties in working memory, executive function, and flexible cognition. This inconsistency has made it difficult to define a single cognitive profile associated with autism. These contradictions may be due, in part, to how much cognitive functioning can differ across people with ASD. Cognitive capabilities and difficulties can fluctuate greatly depending on age, co-occurring psychiatric symptoms, sensory processing style, and individual differences in how information is encoded and maintained. ASD is increasingly understood not as a homogeneous condition but as a spectrum of cognitive phenotypes that vary across individuals, contexts, and developmental stages. This heterogeneity complicates attempts to define consistent cognitive strengths or deficits associated with the disorder and challenges traditional categorical models of cognition.

While some studies indicate increased sensory precision and distinct cognitive capabilities, such as enhanced attention to local detail (Mottron et al., 2006; Bott et al., 2006), others reveal deficits in working memory and executive function. These conflicting findings have led to ongoing debate regarding whether perceptual strengths in ASD confer advantages at higher cognitive levels or whether they coexist alongside limitations in executive control, memory integration, and flexible attention. A person may demonstrate exceptional sensitivity to sensory information while still experiencing difficulty holding, manipulating, or adapting that information in a broader cognitive context. That distinction matters because perceptual processing and higher-order memory systems may not always work in the same way, even though they are often discussed as if they do. Understanding how sensory-level processing interacts with higher-order cognition is therefore critical for resolving inconsistencies in the literature.

One theoretical framework that has been particularly useful in explaining these inconsistencies is the Bayesian model of perception. According to this model, perception is shaped by both incoming sensory input and prior expectations built from previous experiences. Several researchers have proposed that individuals with autism rely less heavily on prior expectations when interpreting new information (Pellicano & Burr, 2012). In theory, this may allow sensory information to be processed with reduced contextual bias, producing a more immediate or literal perceptual experience. This has often been interpreted as a form of perceptual precision. However, the assumption that more direct sensory processing automatically translates into more accurate or more flexible memory has not been consistently supported. The way information is initially perceived may differ from the way it is organized, retained, or used later. For that reason, perceptual strengths and memory outcomes should not automatically be treated as the same thing.

The purpose of this study is to examine the connection between working memory and the precision of sensory processing in people with ASD, while taking psychiatric comorbidities and individual heterogeneity into account. Looking at these factors together may help explain why past research has been so inconsistent and may also give a clearer picture of cognitive variability associated with autistic traits. This study aims to provide insight into executive function abnormalities and memory-related processing through a quantitative framework that does not rely on rigid diagnostic categories. By examining autistic traits dimensionally rather than categorically, this work aligns with contemporary approaches that emphasize continuous variation in cognitive functioning across the autism spectrum rather than assuming a clear divide between “autistic” and “non-autistic” cognition.

Cognitive function varies among people with ASD, especially in working memory and sensory memory. According to the Bayesian model of perception, researchers argue that people with autism may exhibit enhanced sensory recall because they rely less on past experiences and contextual priors when processing new information (Pellicano & Burr, 2012). This reduced reliance on prior expectations may result in heightened sensitivity to incoming sensory input, allowing individuals with ASD to encode perceptual information with less contextual influence. In some settings, this may be beneficial because it may help with detailed visual discrimination or make individuals less influenced by top-down bias. However, the same processing style may also make it harder to efficiently generalize, integrate context, or flexibly adapt information across changing environments.

Working memory studies, on the other hand, have produced far less consistent conclusions. The consequences on visuospatial working memory are still debated, while verbal working memory deficiencies are more consistently documented (Habib et al., 2019). Even within visuospatial domains, some studies report preserved or even enhanced performance under specific task conditions, while others find deficits once task complexity, distractor load, or executive demands are increased. These inconsistencies suggest that working memory performance in ASD may depend heavily on the structure of the task being used and on the cognitive demands required to perform it. Research on working memory has therefore yet to provide a definitive conclusion regarding the cognitive effects of autism. Developing better support systems in educational, occupational, and clinical settings requires a clearer understanding of when certain cognitive patterns function as strengths and when they create difficulty. We hypothesize that individuals with ASD have greater categorical encoding (higher SDc) and higher precision in working memory.

Executive function deficits in ASD have been linked to prefrontal cortical dysfunction and disrupted large-scale neural networks (Barendse et al., 2013). Working memory performance is further impacted by deficiencies in cognitive flexibility, inhibition, attentional control, and task switching. Executive dysfunction may therefore act as a meaningful bridge between perceptual processing and behavioral outcomes, influencing how sensory input is retained, manipulated, prioritized, and applied in real-world situations. Even if information is initially encoded with high fidelity, difficulties in updating or flexibly reorganizing that information may still affect performance on later cognitive tasks.

Psychiatric comorbidities such as anxiety, depression, obsessive-compulsive features, and schizotypal traits are also common in individuals with ASD. These co-occurring conditions can affect attention, motivation, cognitive flexibility, and memory performance in ways that may obscure or exaggerate autism-related cognitive findings (Vannucchi et al., 2014). Anxiety, for example, may narrow attentional scope or heighten vigilance, while depression may reduce cognitive efficiency or working memory engagement. Rumination may consume attentional resources that would otherwise be available for task performance. These factors must be taken into account when assessing cognition in ASD so that cognitive findings are not misattributed to autistic traits alone. Examining comorbidities alongside autistic traits allows for a more accurate characterization of cognitive heterogeneity and helps distinguish whether observed differences in precision or capacity are attributable to ASD-related processing, co-occurring psychiatric burden, or both.

Traditional research on ASD often relies on small sample sizes and generalized trait assessments; however, this approach may fail to capture the condition's cognitive heterogeneity. When participants are grouped too broadly, meaningful individual differences can be averaged out, making it harder to detect the patterns that actually matter. This can contribute to inconsistent findings across studies and reinforce the false idea that autism-related cognition should look the same across individuals. To address this problem, it was crucial to investigate individual differences and identify cognitive subgroups using larger samples and hierarchical Bayesian modeling (Lombardo et al., 2019). These methods make it possible to evaluate cognitive variability more precisely and to estimate not only average performance but also the structure of differences across people. This offers a more realistic way of studying cognition in ASD and may help clarify the ongoing discussion surrounding memory precision and sensory processing.

Methods

This study examined how individual traits such as ASD-like characteristics, as well as interactions with other psychiatric conditions, predicted or contributed to working memory function in terms of memory precision, variability, and storage capacity. A total of 155 individuals participated in the study. Participants were recruited to capture a broad range of autistic traits within a non-clinical population, allowing for dimensional analysis rather than binary diagnostic comparisons. This approach was important because it enabled the study to examine how variation in autistic traits may relate to cognition, even in individuals who do not meet formal diagnostic thresholds. Rather than comparing "autistic" versus "non-autistic" groups, the study focused on cognitive variation across a continuum.

To evaluate ASD-like characteristics, we used the Autism Spectrum Quotient (AQ), a widely used self-report tool for assessing autistic features in social skills, attention switching, attention to detail, communication, and imagination. The AQ, developed by Baron-Cohen et al. (2001), provides a standardized method for identifying the presence of autistic traits in both clinical and general populations. Typically, individuals with ASD score higher on the AQ than neurotypical individuals, and a score of 32 or higher implies an increased chance of receiving an ASD diagnosis (Baron-Cohen et al., 2001). Using the AQ as a continuous variable allowed for examination of graded relationships between autistic traits and cognitive performance rather than relying on categorical group comparisons. This was especially useful for identifying whether certain subtraits, such as attention to detail, may show stronger associations with memory-related outcomes than overall AQ scores alone.

To assess the impact of psychiatric comorbidities, additional psychiatric screening instruments were utilized. The GAD-7 and PHQ-9 were used to evaluate anxiety and depressive characteristics in the sample, and SPD was used to assess schizotypal phenotypes. Data collected from these measures allowed us to examine how different psychological features and their interactions may influence working memory and sensory processing. Including multiple psychiatric measures also made it possible to account for overlapping symptom profiles that could otherwise distort the interpretation of the relationship between autistic traits and cognitive performance. Because ASD frequently co-occurs with other psychiatric characteristics, this was an important part of the study design rather than a secondary consideration.

To evaluate sensory memory precision, the study modified Zhang and Luck's (2008) color wheel paradigm, a widely used task that measures the precision of stored visual information. In this task, participants are typically required to remember visual features, such as color, over a short delay and then reproduce or identify those features as accurately as possible. Performance on this task allows researchers to estimate the extent to which visual information is stored with fine-grained precision versus broader categorical structure. In the context of the present study, this paradigm was useful for examining whether individuals with higher autistic traits encoded sensory information with greater detail or instead relied more heavily on broader categorical representations.

Sensory memory, working memory, and executive control are closely related, but they are not identical processes. Measuring them together allowed the study to assess whether differences in early perceptual encoding would extend into later stages of information maintenance and manipulation. This was especially important given the conflicting literature suggesting that strengths at one level of cognition may coexist with limitations at another.

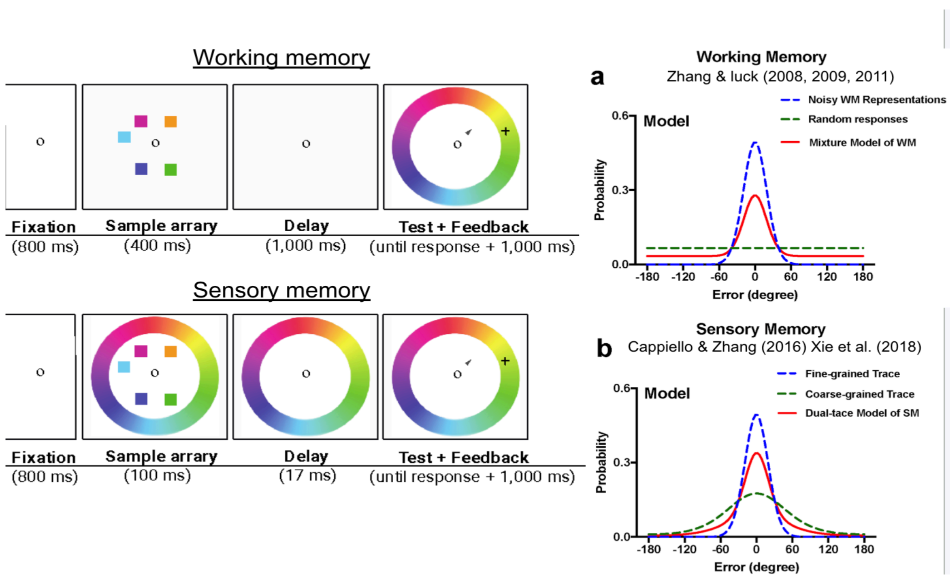

Figure 2. Task design and computational models for working memory and sensory memory. Participants completed parallel color report tasks designed to measure working memory and sensory memory. The working memory condition included a longer delay interval, whereas the sensory memory condition used a much shorter delay. The accompanying model schematics illustrate how response error distributions were used to estimate memory precision and trace structure.

Additionally, the study examined correlations between cognitive performance and psychiatric comorbidities to assess their broader impact on executive function in ASD-related traits. To quantify individual differences and identify potential cognitive subgroups, a hierarchical Bayesian mixture model was used to provide a statistically sound method of addressing cognitive heterogeneity (Xie et al., 2018). By updating prior beliefs with observed data, Bayesian modeling quantified uncertainty and generated probability distributions that reflected both individual-level and group-level patterns. This method was especially useful for a study focused on variability because it does not assume that all participants should be represented by a single average cognitive profile. Instead, it allows patterns of precision, variability, and capacity to be estimated in a way that better reflects the complexity of real human cognition. This modeling approach helped determine whether increased sensory memory precision was associated with decreased working memory flexibility, as hypothesized. Furthermore, this approach enabled a more nuanced interpretation of how cognitive variability manifests across individuals by distinguishing between underlying latent subgroups and continuous variation, thereby providing a more precise framework for understanding how differences in sensory encoding and executive function may interact within and across individuals with varying levels of autistic traits.

Results

Participants (N = 155) scored between 2 and 34 on the AQ, with most falling below the clinical threshold of 32. This was expected, as autistic traits were measured dimensionally across the full spectrum rather than for diagnostic purposes. A significant positive correlation was found between Autism Spectrum Quotient (AQ) scores and coarse-grained sensory memory, as indicated by the standard deviation of categorical responses (SDc) in the color wheel task (r = .19, 95% CI [.04, .34], p = .017). Given this relationship, higher AQ scores were associated with greater SDc. This suggests greater

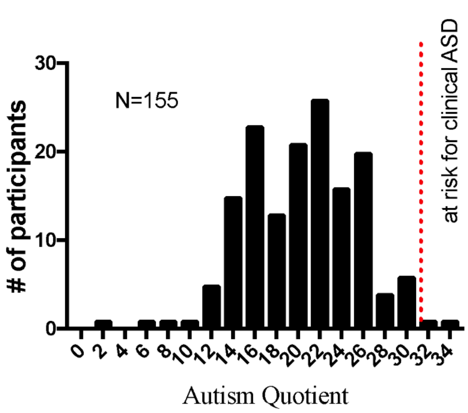

Figure 1. Distribution of Autism Spectrum Quotient (AQ) scores in the sample. AQ scores for the 155 participants ranged from 2 to 34, with most scores falling below the clinical cutoff of 32. The dotted red line marks the threshold associated with elevated risk for clinical ASD.

categorical encoding in individuals who scored higher in autistic traits.

A related AQ subscale, attention to detail, also showed a significant positive correlation with SDc ($p < .05$), indicating that participants who reported greater attention to detail tended to perceive or encode sensory information in a more categorical format rather than preserving it in a highly precise continuous form. This finding is especially notable because attention to detail is often discussed as if it automatically reflects more exact perceptual processing, when, in this case, the data suggest something more specific about how information may be organized in memory. In this case, however, the data suggest that heightened trait-level attention to detail may be associated with a particular style of encoding rather than uniformly enhanced sensory precision. Rather than reflecting improved fine-grained retention, this pattern may indicate a tendency to organize information into broader perceptual categories.

There was no significant correlation between AQ total scores and working memory precision ($p > .05$), indicating that, within this sample, higher autistic traits did not predict enhanced precision in working memory, contrary to our hypothesis. This implies that the processes driving the short-term maintenance and manipulation of information in working memory may differ from those influencing sensory memory. These results suggest that sensory-level differences do not necessarily translate into higher-order memory benefits, even when perceptual processing itself may appear distinctive.

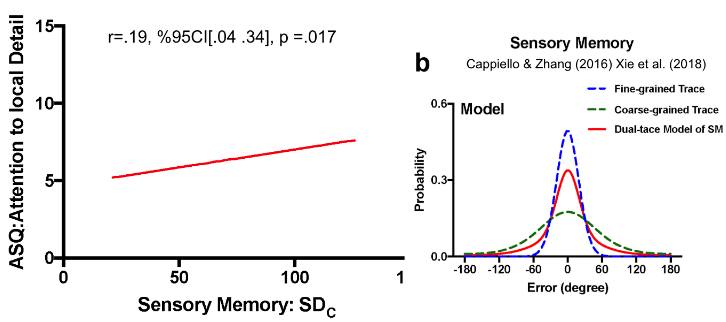

Figure 4. Positive association between sensory memory categorical encoding and AQ attention-to-detail scores. Higher sensory memory SDc values were associated with higher scores on the AQ attention-to-detail subscale, indicating that greater coarse-grained sensory encoding was related to increased attention-to-local-detail traits.

Considering psychiatric comorbidities, significant positive correlations were found between AQ scores and other psychiatric conditions, including depressed mood (PHQ-9), anxiety symptoms (GAD-7), rumination, and schizotypal personality traits (SPD) (all $p < .05$). No significant relationships were found between AQ scores and multimedia multitasking (MMI) or SAT performance (both $p > .05$). At the time of analysis, impulsivity measures had not yet been processed. These relationships reinforce the idea that individuals with elevated autistic traits may also experience increased psychiatric burden, which could meaningfully influence cognitive performance and should therefore be considered in interpretation.

To further examine the relationship between autistic traits and memory, a linear regression analysis was conducted. This model was aimed at determining how working memory and sensory memory performance could predict scores on the AQ attention-to-detail subscale while controlling for mood-related covariates, including depressed mood, anxiety, rumination, schizotypy, and multimedia multitasking. Consistent with predictions, working memory capacity (Pm, $\beta = 3.2$ [1.0, 5.5], $p = .005$) and coarse-grained sensory memory (SDc, $\beta = .03$ [.01, .5], $p = .010$) were found to be robust predictors of attention to detail after taking these mood-related covariates into account. Incorporating working memory capacity and sensory memory into the model substantially enhanced its predictive accuracy for attention-to-detail scores compared to the model that only included mood-related factors ($\Delta R^2 = 0.08$, $F(2,138) = 6.05$, $p = .003$), accounting for an additional 8% of variance in attention-to-detail scores.

Overall, the hypotheses of the study were partially supported. The prediction that a higher AQ score would predict greater categorical encoding in sensory memory was supported, as there was a significant positive correlation between the two. However, the hypothesis that higher AQ scores would be associated with more precise working memory representations was not supported, as no significant relationship between AQ and working memory precision was found. The final prediction that coexisting psychiatric symptoms would predict behavioral traits was supported, specifically for the attention-to-detail subscale: both working memory capacity and sensory memory categorical encoding significantly predicted attention-to-detail scores, even after controlling for mood-related covariates.

Discussion

Our findings reveal a nuanced relationship between autistic traits and cognitive processing, particularly in the distinction between sensory memory and working memory. The AQ was positively correlated with categorical encoding in sensory memory, suggesting that individuals with higher autistic traits may rely more heavily on broader representational categories when perceiving and storing information. At the same time, AQ scores were not significantly associated with working memory precision, indicating that the mechanisms underlying sensory memory and working memory may operate differently and should not be collapsed into a single explanation of memory performance in ASD. This distinction is important because much of the broader conversation around autism and cognition has historically treated perceptual detail, memory precision, and cognitive advantage as though they naturally move together. Our findings suggest that they may not.

The positive association between AQ scores and coarse-grained sensory encoding offers a particularly interesting interpretation. At first glance, this finding may appear counterintuitive. Individuals with elevated autistic traits are often described as detail-oriented, perceptually sharp, or unusually sensitive to sensory input. It would be easy to assume that this should result in finer-grained memory representations. However, our data suggest that increased autistic traits may instead be associated with a tendency to encode sensory information in a more categorical way. This does not necessarily mean that perception is less detailed. Rather, it may indicate that information is organized and retained differently once it enters memory.

This distinction between perceiving something in detail and storing it with precision matters. A person may notice very subtle features of an object or environment in the moment, but that does not guarantee those details will be retained in a flexible or continuous form over time. Instead, they may be encoded in a way that favors recognizable categories or broader groupings. In practical terms, this may help explain why some individuals with elevated autistic traits appear highly sensitive to sensory differences yet still show variability in tasks requiring memory flexibility or reconstruction.

These findings are broadly consistent with Bayesian theories of perception, which propose that individuals with ASD may rely less heavily on prior expectations or contextual information when interpreting new sensory input (Pellicano & Burr, 2012). A reduced influence of prior beliefs may result in sensory experiences that feel more immediate or less filtered by expectation. However, that does not necessarily imply that memory will preserve those experiences in a highly precise form. If perceptual input is processed in a more immediate way but is less integrated with context, it may later be retained in a form that is less flexible or harder to generalize. This may help explain why enhanced perceptual processing is sometimes observed alongside cognitive rigidity.

Another important implication of the present findings is that sensory-level processing and working memory may rely on partially independent systems. The absence of a significant relationship between AQ scores and working memory precision suggests that whatever contributes to variation in sensory encoding may not extend cleanly into later stages of cognitive maintenance and manipulation. Working memory involves updating, attentional control, and prioritization of information over short periods of time. These processes depend heavily on executive systems rather than on perceptual encoding alone.

This may help explain why previous literature has been so inconsistent. Some studies capture task conditions in which perceptual sensitivity or immediate encoding offers an advantage, especially when tasks are visually structured or minimally dependent on flexible control. Other studies measure contexts in which successful performance depends on inhibition or updating. In those cases, perceptual sensitivity alone may not support better performance. This could create the impression that autism is sometimes associated with enhanced cognition and other times associated with deficits, when in reality, different systems are being measured.

Executive function likely plays an important role in this disconnect. Working memory does not operate in isolation. It is closely tied to inhibition, attentional shifting, and cognitive flexibility. Prior work has linked executive dysfunction in ASD to altered prefrontal function and disrupted network coordination (Barendse et al., 2013). If sensory information is encoded differently in individuals with elevated autistic traits, but the systems needed to flexibly update that information are not equally enhanced, then the result may be uneven performance across tasks. A person may distinctively encode information without necessarily gaining an advantage in how that information is later used.

This distinction may also help explain real-world experiences often reported by individuals with elevated autistic traits. Someone may notice patterns or environmental changes that others overlook, yet still struggle in situations that require rapid adaptation or multitasking. Many environments reward not only attention to detail, but also the ability to reorganize information under changing demands. A cognitive profile involving strong perceptual sensitivity but inconsistent flexibility may produce both strengths and challenges depending on context.

The present study also reinforces the importance of psychiatric comorbidities in understanding cognitive variation associated with autistic traits. Significant positive correlations were found between AQ scores and depression, anxiety, rumination, and schizotypal traits. These relationships are not surprising, but they are important to consider. Cognitive performance does not occur in isolation. Anxiety can shift attention and increase vigilance. Depression can reduce cognitive efficiency. Rumination can occupy working memory resources and interfere with task performance. If these factors are not considered, it becomes easy to attribute all cognitive differences to autistic traits alone.

The regression findings are especially meaningful because they begin to show how multiple cognitive processes may jointly contribute to specific traits. Attention to detail is often treated as a stable characteristic, but the present findings suggest it may also reflect underlying cognitive interactions. Working memory capacity and sensory encoding both predicted attention-to-detail scores, even after mood-related factors were included. This suggests that what we observe behaviorally may emerge from how information is encoded and how effectively it is maintained and managed.

This perspective also contributes to the broader discussion of variability in ASD research. Many earlier studies attempt to describe autism using a single cognitive profile. In practice, variability appears to be one of its defining features. Some individuals may show heightened sensory sensitivity alongside strong memory performance. Others may show sensory differences without advantages in executive systems. Still others may be more influenced by psychiatric factors. Moving toward dimensional models makes it easier to recognize these patterns rather than averaging them together.

This also matters in practical settings, especially when thinking about support and intervention. If cognitive strengths and difficulties are unevenly distributed, then support strategies should not assume that one approach will address all challenges. A person who performs well on perceptual tasks may still need support related to organization or working memory load. At the same time, perceptual strengths may be useful in certain contexts if they are recognized and supported.

Overall, the findings of this study suggest that autistic traits are associated with differences in sensory encoding, but not necessarily with enhanced working memory precision. They also show that psychiatric symptoms and executive demands are important for interpreting cognitive performance. Together, these results support a more differentiated view of cognition in ASD, where different systems contribute in different ways rather than producing a single consistent profile.

Limitations and Future Implications

Although the present study provides useful insight into the relationship between autistic traits, sensory encoding, working memory, and psychiatric comorbidities, several limitations should be acknowledged. First, the sample consisted of individuals drawn from a non-clinical population rather than a formally diagnosed ASD group. While this dimensional approach was valuable for examining variation in autistic traits across a broad spectrum, it also limits the extent to which findings can be generalized to clinically diagnosed autistic populations. Individuals with elevated AQ scores in a general population sample may share certain cognitive tendencies with autistic individuals, but they do not fully represent the diversity or lived complexity of a clinically diagnosed ASD population.

Second, the use of self-report measures such as the AQ, PHQ-9, GAD-7, and schizotypal screening instruments introduces the possibility of reporting bias. Self-report tools are useful and widely validated, but they rely on introspection, interpretation of questions, and willingness to disclose symptoms accurately. This means that some aspects of autistic traits or psychiatric burden may not have been fully captured. Future studies may benefit from combining self-report measures with clinician-administered assessments or behavioral markers to strengthen interpretability.

Another limitation involves the interpretation of the color wheel paradigm and related memory measures. Although these tasks are widely used to estimate sensory precision and working memory characteristics, laboratory tasks can only approximate the complexity of cognition in real-world settings. Remembering a color over a short delay is informative, but it does not fully capture how individuals encode and use information in everyday environments filled with competing stimuli, emotional context, and changing demands. Future research should examine whether similar patterns of categorical encoding and working memory dissociation appear in more ecologically valid cognitive tasks.

It is also important to note that impulsivity measures had not yet been processed at the time of analysis. This is relevant because impulsivity may influence attention allocation and executive performance in ways that intersect with both autistic traits and psychiatric symptoms. Including impulsivity in future analyses may help provide a more complete account of how multiple psychological dimensions contribute to cognitive variability.

Future research should also examine whether similar patterns emerge in clinically diagnosed ASD populations across different age groups. Cognitive processing in autism is not static, and the developmental stage may meaningfully influence the relationship between sensory encoding and working memory. Longitudinal studies may be especially useful in determining whether these cognitive patterns remain stable over time or shift in response to maturation, treatment, or environmental demands. In addition, future work should continue using hierarchical and dimensional modeling approaches, as these methods are especially well-suited for capturing the variability that appears central to ASD-related cognition.

Finally, future studies may benefit from investigating how these findings relate to functional outcomes in daily life. Understanding whether categorical sensory encoding or working memory variability predicts academic performance, occupational functioning, emotional regulation, or adaptive coping would help bridge the gap between laboratory findings and real-world relevance. This would be especially valuable for designing interventions that reflect how cognition is actually experienced outside of controlled experimental settings. Such work would also contribute to the development of more individualized strategies for the diverse cognitive profiles that exist among individuals with Autism Spectrum Disorder.

Conclusion

This study aimed to clarify the relationship between autistic traits, sensory memory precision, working memory, and psychiatric comorbidities by adopting a dimensional and quantitative approach. By examining individual variability rather than relying on categorical diagnostic groupings, the findings contribute to a more nuanced understanding of cognitive heterogeneity associated with Autism Spectrum Disorder. The results demonstrate that higher autistic trait scores are associated with greater categorical encoding in sensory memory, while no corresponding enhancement in working memory precision was observed. These dissociations suggest that sensory-level processing differences in individuals with elevated autistic traits do not necessarily translate to improved higher-order memory functions.

Importantly, the findings highlight that sensory memory and working memory appear to rely on partially distinct mechanisms and neural systems. While sensory memory performance was linked to autistic traits and attention-to-detail tendencies, working memory precision showed no direct association with AQ scores. This distinction supports theoretical models proposing that early perceptual processing and executive control systems contribute independently to cognitive functioning in ASD. It also helps explain why prior literature has produced inconsistent conclusions when these domains were discussed too broadly or treated as interchangeable.

The strong associations observed between autistic traits and psychiatric comorbidities further emphasize the importance of considering mental health factors when interpreting cognitive performance in ASD-related research. Anxiety, depression, rumination, and schizotypal traits were all significantly correlated with AQ scores, underscoring the extent to which co-occurring psychiatric symptoms may shape cognitive outcomes. These findings reinforce the necessity of incorporating psychiatric covariates into analytical models in order to avoid oversimplified interpretations of cognitive strengths or deficits attributed solely to autistic traits.

These findings also support the use of dimensional approaches and hierarchical modeling, since they make it easier to capture the kind of variability seen across individuals. By integrating sensory memory, working memory, executive function, and psychiatric measures, the study provides a more complete picture of how multiple cognitive processes shape behavioral traits such as attention to detail. These insights may help guide future research aimed at developing targeted interventions and support strategies that reflect both cognitive profiles and co-occurring mental health conditions. Advancing our understanding of cognitive heterogeneity in ASD will require continued attention to individual differences across multiple levels of processing rather than relying on singular or generalized models of cognition.

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