Statistical learning in relation to ASD and ADHD traits: Further evidence for a spectrum of impairment

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Background

Our environment is filled with continuous information that we must learn to segment into discrete meaningful units.

One way to increase processing efficiency is to track patterns and probabilities within the environment, a process referred to as statistical learning.

Links between statistical learning and language have primarily been explored in children with language or reading disorders. Little is known about how it relates to ASD and ADHD, where language and communication are also impacted.

Study Aims

Investigate whether statistical learning occurs using well-established, traditional auditory and visual tasks.

Investigate how statistical learning relates to traits associated with two prevalent disorders, ASD and ADHD.

Method

Undergraduate students (N= 95; *Mean age* = 18.18) passively listened to auditory syllables and observed visual shape sequences that followed a statistical pattern.

Auditory Statistical Learning Paradigm:

Syllables were presented sequentially in triplet sequences and combined into trisyllabic pseudowords.

Transitional Probabilities

The probability of X, given Y:

$$Y|X = \frac{frequency\ of\ XY}{frequency\ of\ X}$$

There were higher transitional probabilities within words (1.0 or 0.33) than between words (0.1 or 0.2).

Syllables:

tu, ti, bu, ba, bu, pu, bu, pa, da, pi, da, di, pa, tu, bi, du, ta, ba

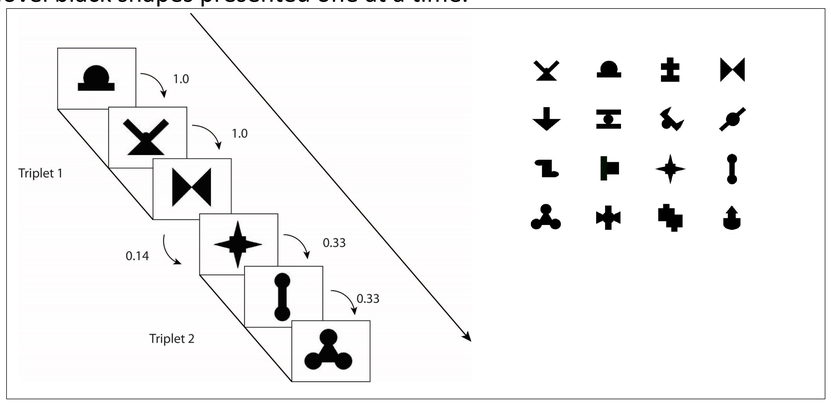
Words:

tutibu, babupu, bupada, pidadi, , patubi and dutaba

Method

Visual Statistical Learning Paradigm:

Novel black shapes presented one at a time.



Within-triplet transitional probabilities were higher (.33 and 1.0) than between-triplet transitional probabilities (.14 or less).

Participants were then tested on the familiarity of the sequences.

Auditory Statistical Learning

Choose the pattern of sounds you are most familiar with.

1. ***babedo (word)***
2. **fepumo *(foil)***

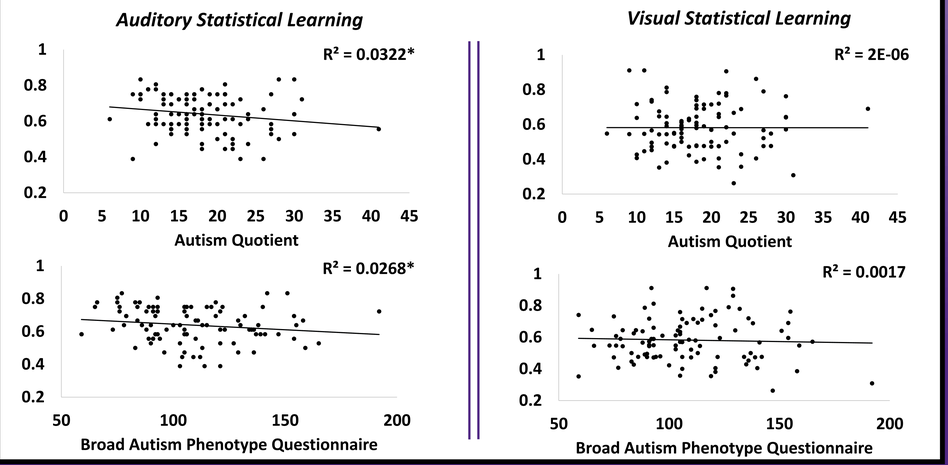
Visual Statistical Learning

Choose the pattern of shapes you are most familiar with.

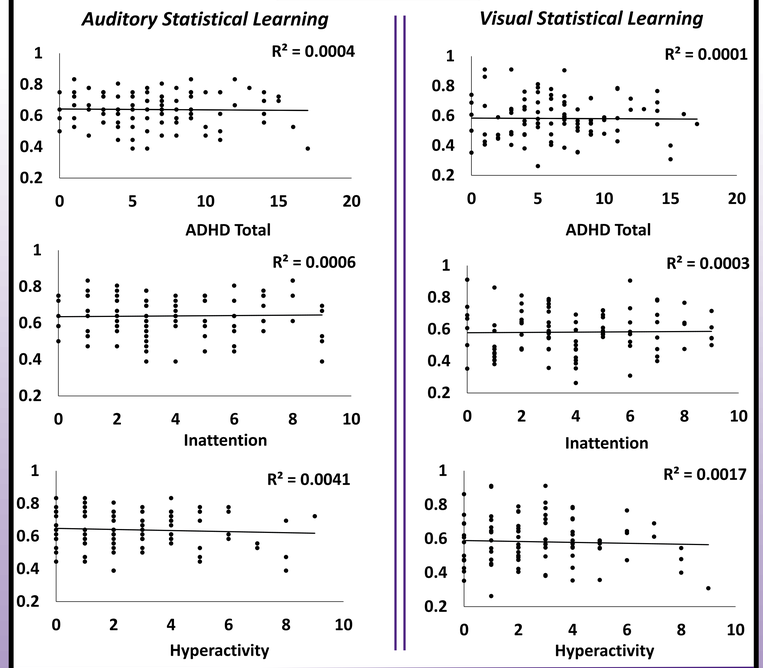
1. ***(triplet)***
2. ***(foil)***

ASD traits were measured using **the Broad Autism Phenotype Questionnaire (BAPQ)** and **Autism Quotient (AQ)** and ADHD traits were measured using the **Adult ADHD Self-report Scale (ASRS).**

ASD Results



ADHD Results



Participants demonstrated above-chance performance for both SL tasks (auditory 70%, $t_{(18)} = 18.22$, $p<.001$, visual 68%, $t_{(18)} = 19.60$, $p<.001$).

Discussion

Poor performance on the auditory SL task was significantly related to increased ASD, but not ADHD traits.

Although effects were weak, those with higher ASD traits demonstrated increased auditory, but not visual SL difficulties.

Deficits in auditory SL may contribute to the language and social challenges reported in ASD, while other mechanisms may underlie these challenges in ADHD..

Our findings highlight the importance of examining a range of traits associated with ASD, ADHD to gain a better understanding of how specific symptomatology is linked to SL.

References

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