

# Neurobehavioral Differences in Children with DS, ASD, and DS+ASD: Using the ND-PROM

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## BACKGROUND

- Autism spectrum disorder (ASD) is common in Down syndrome (DS).<sup>1</sup>
- Diagnosis of ASD in individuals with DS relies on a clinician's experience with ASD, DS, and DS+ASD populations.
- There are no standardized symptom monitoring tools that assess for symptoms of ASD in individuals with DS.

## OBJECTIVES

- To use a symptom monitoring tool (Neurodevelopmental Parent Report for Outcome Monitoring (ND-PROM))<sup>2-3</sup> to investigate differences in developmental skills and behaviors in children with DS, DS+ASD, and ASD.
- To determine which symptoms and behaviors are most specific to those with a co-occurring diagnosis of ASD within the DS population.

## PARTICIPANTS + METHODS

	DS+ASD	DS	ASD
n	53	385	246
Age (median (IQR))	9.3 (6.3-13.0)	8.28 (4.9-12.3)	8.8 (6.4-11.9)
Male n (%)	39 (73.6%)	204 (53.0%)	205 (83.3%)

- ND-PROM:** 93 Likert scale-type questionnaire validated in ASD and DS populations: used to assess core features and comorbidities that occur in ASD.

## ND-PROM

ASD diagnostic DSM-5 criteria	Common co-occurring symptoms/behaviors
Sensory Processes	Expressive Language
Nonverbal Communication	Receptive Language
Social Emotional Understanding	Adaptive Skills
Social Interaction	Challenging Behaviors
Independent Play	Mental Health
RRBS and Interests	Impulse/ADHD

- Analyses: ANOVA tests and post-hoc t tests.
- Comparisons made for ND-PROM for domains consistent with DSM-5 criteria and co-occurring symptoms/behaviors.

## RESULTS

Fig. 1. Comparison of DS, DS+ASD, and ASD groups by DSM-5 relevant domains.

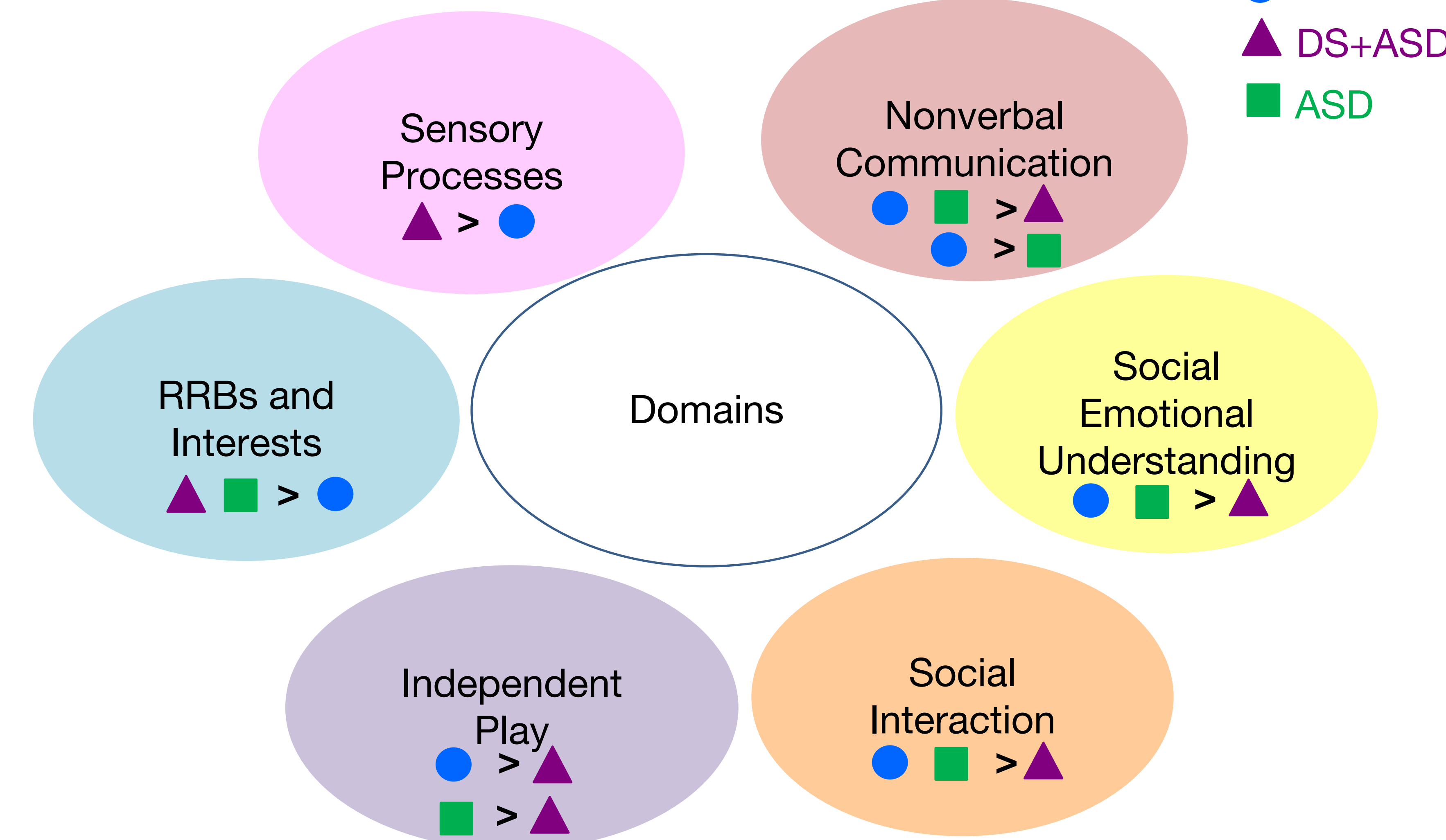


Fig. 2. Comparison of DS, DS+ASD, and ASD groups by co-occurring symptoms/behaviors (non-DSM-5 domains).

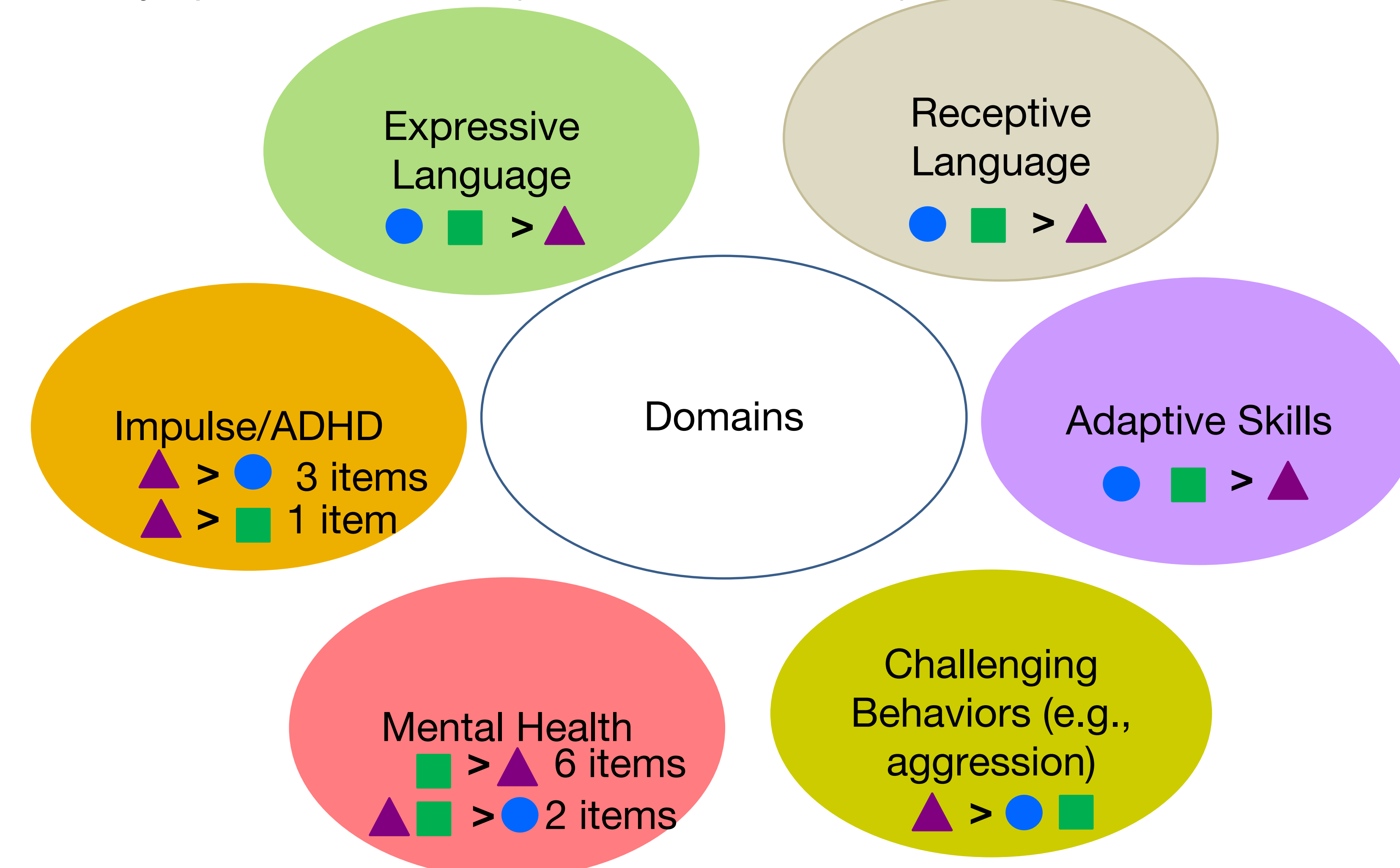


Table 1. ND-PROM questions that best distinguish DS vs DS+ASD groups.

Question	Mean Difference
1. Makes comments (e.g., "Look! Dog!")	● > ▲
2. Points to share interest when not requesting (shows you an airplane in the sky)	● > ▲
3. Pretends to be a superhero, teacher, or other character ("Novel role play")	● > ▲
4. Has repetitive movements (e.g., hand flapping, finger wiggling, jumping)	▲ > ●
5. Offers comfort to others (give you a hug if you are sad)*	● > ▲
6. Plays simple social games (peek-a-boo, tag, hide-and-seek)	● > ▲
7. Demonstrates sportsmanship (>5 years old)	● > ▲
8. Tells others what to do	● > ▲
9. Appropriately gets someone's attention to start or end an interaction (calls name, taps shoulder, or makes eye contact before speaking)	● > ▲
10. Indicates "Yes" or "No"	● > ▲

## SUMMARY

- In general, the DS+ASD group had the most impairment, the DS group displayed the least impairment, and there was variable strengths and challenges in the ASD group.
- DS and DS+ASD groups had the most differences among DSM-5 criteria items.
- ASD and DS+ASD group had the most differences among non-DSM items.

## CONCLUSIONS

- Using the ND-PROM, we detected different symptom clusters in DS, ASD, DS+ASD groups.
- Findings suggest different neurobehavioral phenotypes in these 3 groups.
- Understanding differential patterns of symptoms can improve recognition and diagnostic fidelity of ASD among the DS population.
- Future studies should investigate the role of cognition and its impact on social and behavioral profiles in those with DS and DS+ASD.

## REFERENCES

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