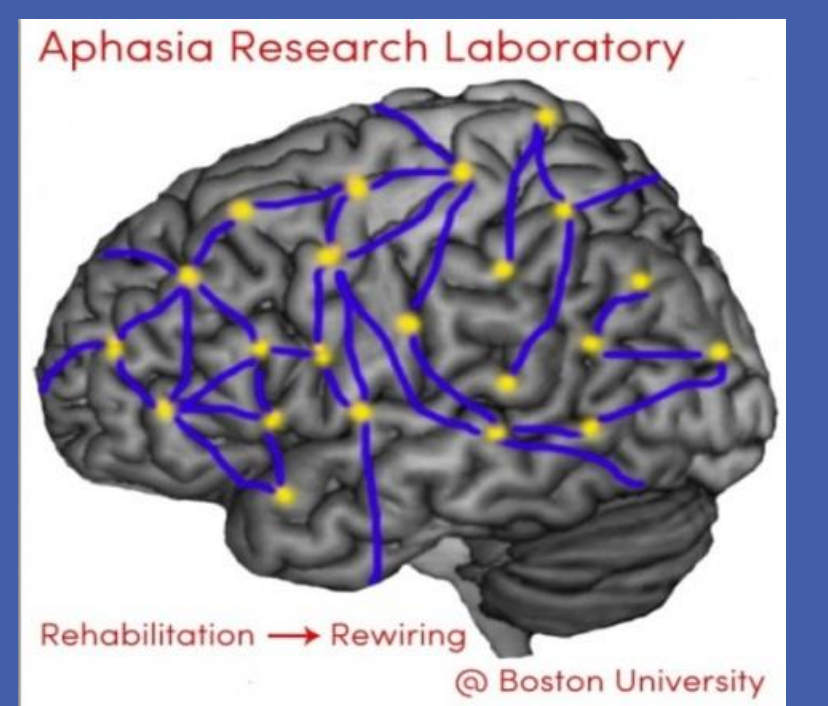


Understanding semantic and phonological processing deficits in adults

with aphasia: Effects of category and typicality

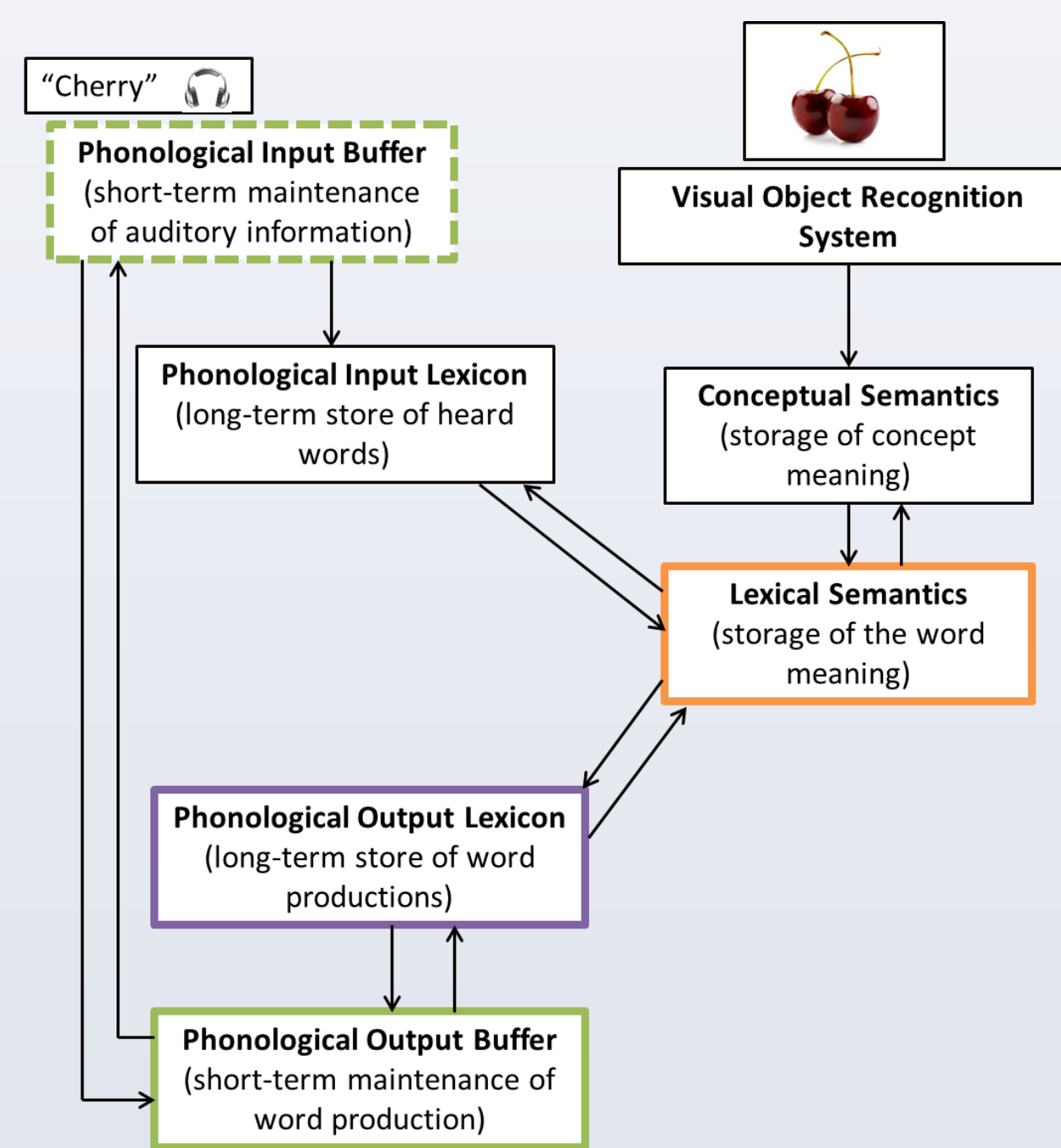
Erin Meier¹, Melody Lo², & Swathi Kiran¹

Boston University, Sargent College of Health and Rehabilitation Sciences¹; South Shore Hospital, Weymouth, MA²



BACKGROUND

- According to most models of lexical processing (e.g., Dell et al., 1997; Levelt, Roelofs, & Meyer, 1999), semantic and phonological information are processed in separate stages; the level of interaction between stages remains debated
- Understanding whether lexical processing is discrete or interactive helps facilitate interpretation and treatment of different deficit profiles in persons with aphasia (PWA)
- Certain psycholinguistic factors also impact processing at different stages in PWA
- Previous studies (e.g., Kiran & Thompson, 2003) have found item category and typicality impact semantic processing in PWA but no studies to date have examined these effects in both semantic and phonological tasks



CURRENT STUDY

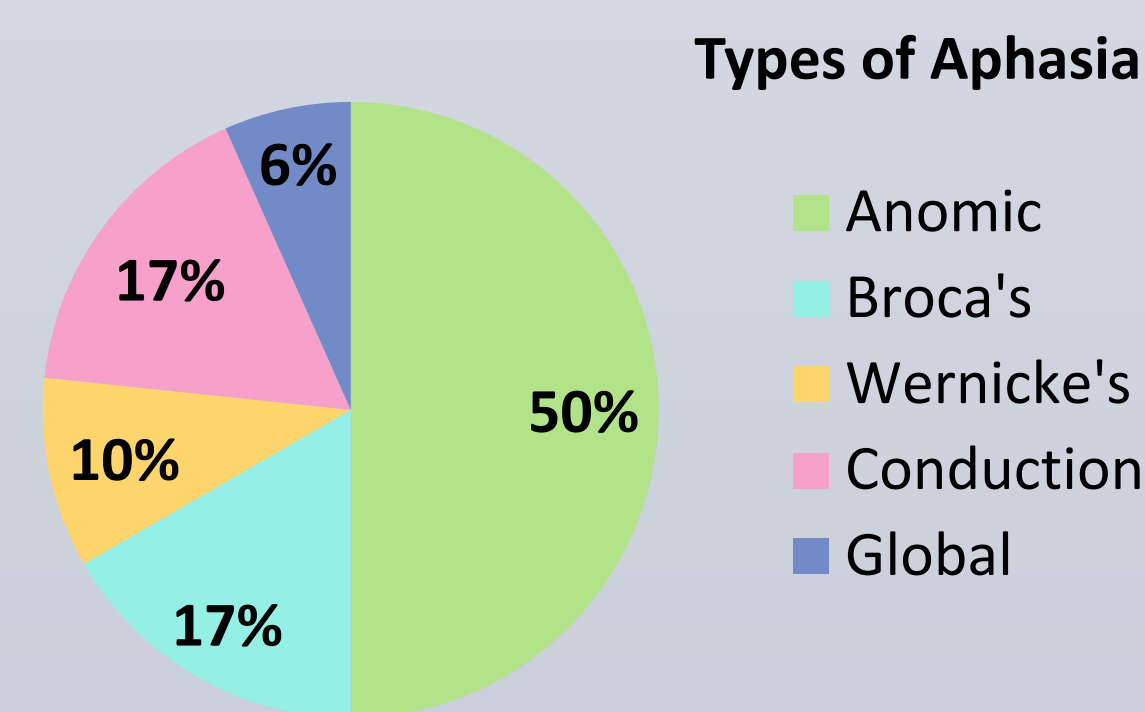
AIM: To further the understanding of the nature of semantic and phonological processing in PWA versus neurologically-intact controls by examining general processing differences as well as the effects of category and typicality on processing within each system

- RQ 1:** What are the differences between controls and PWA in processing according to accuracy and RT on nine semantic and phonological tasks?
- RQ 2:** How do task demands influence processing according to accuracy and RT within each group?
- RQ 3:** What are the effects of category and typicality on processing according to accuracy and RT within the semantic and phonological tasks in each participant group?

METHOD

Participants

- 32 PWA as a result of left MCA stroke(s) and 10 neurologically-intact controls participated
- PWA were administered a battery of standardized language assessments including the Western Aphasia Battery-Revised (WAB-R), Boston Naming Test (BNT) & Pyramids and Palm Trees Test (PAPT)



Group		Age	Years of Education	Handedness	Gender	MPO	WAB-R Aphasia Quotient (AQ)	BNT	PAPT
PWA	AVERAGE	62.13	15.32	28R, 4L	20M, 12F	54.13	69.05 / 100	30.97 / 60	46.97 / 52
	Stdev	13.88	2.39			41.58	23.24	19.71	4.59
Controls	AVERAGE	56.90	16.20	9 R, 1L	6M, 4F	N/A	N/A	N/A	N/A
	Stdev	8.24	2.74			N/A	N/A	N/A	N/A

Experimental Tasks

- The experimental tasks were nine computerized tasks with stimuli divided into six semantic categories (vegetables, fruits, birds, furniture, transportation, and clothing) with equal numbers of typical and atypical items
- In each task, yes/no judgments of the target(s) were made via a button press

Semantic (SEM) Tasks

Phonological No-Name (PN-N) Tasks

Phonological Name-Provided (PN-P) Tasks

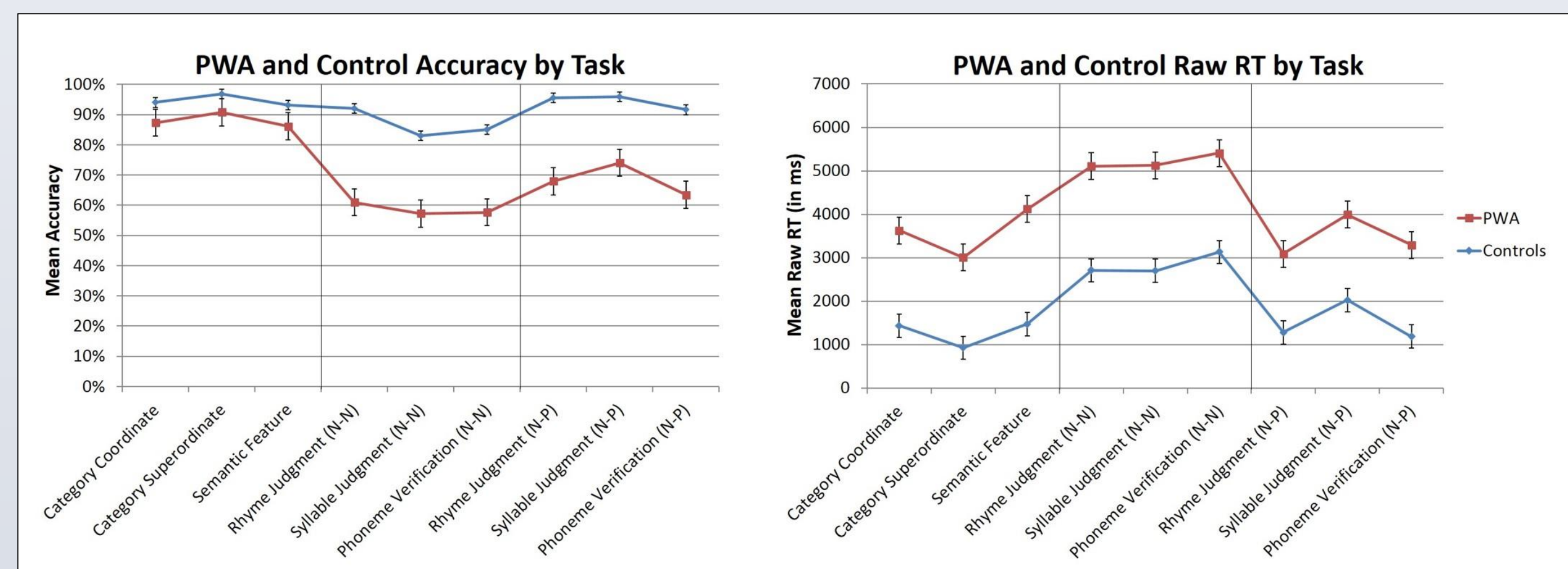
Semantic processing alone | Access to phonological word forms at phonological output lexicon (POL) | Phonological segmentation at phonological buffer

Data Analysis

- Accuracy and RTs on correct trials were collected for each participant
- Raw RTs were used to compare between groups; RTs were converted into z-scores (i.e., zRTs) to normalize data for within-group analyses
- For RQ1 & RQ3, one-way MANOVAs with dependent variables of task accuracy/RT by task type (i.e., SEM, PN-N, PN-P) and independent variables of group and lexical-semantic variable (i.e., category, typicality), respectively, were used
- To address RQ2, hierarchical cluster analyses on accuracy and zRT were performed

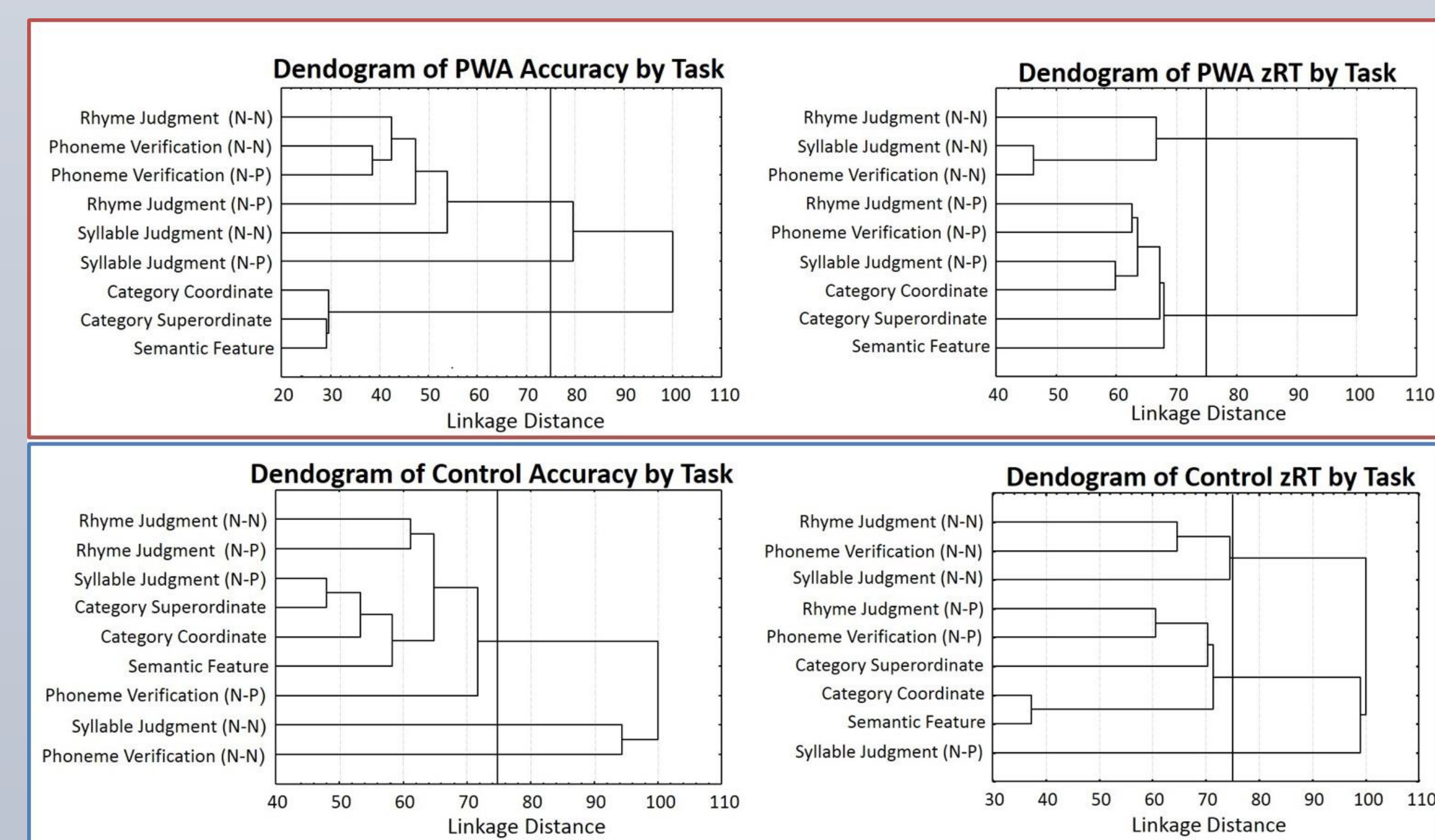
RESULTS

RQ1: What are the differences between controls and PWA in processing across all tasks?



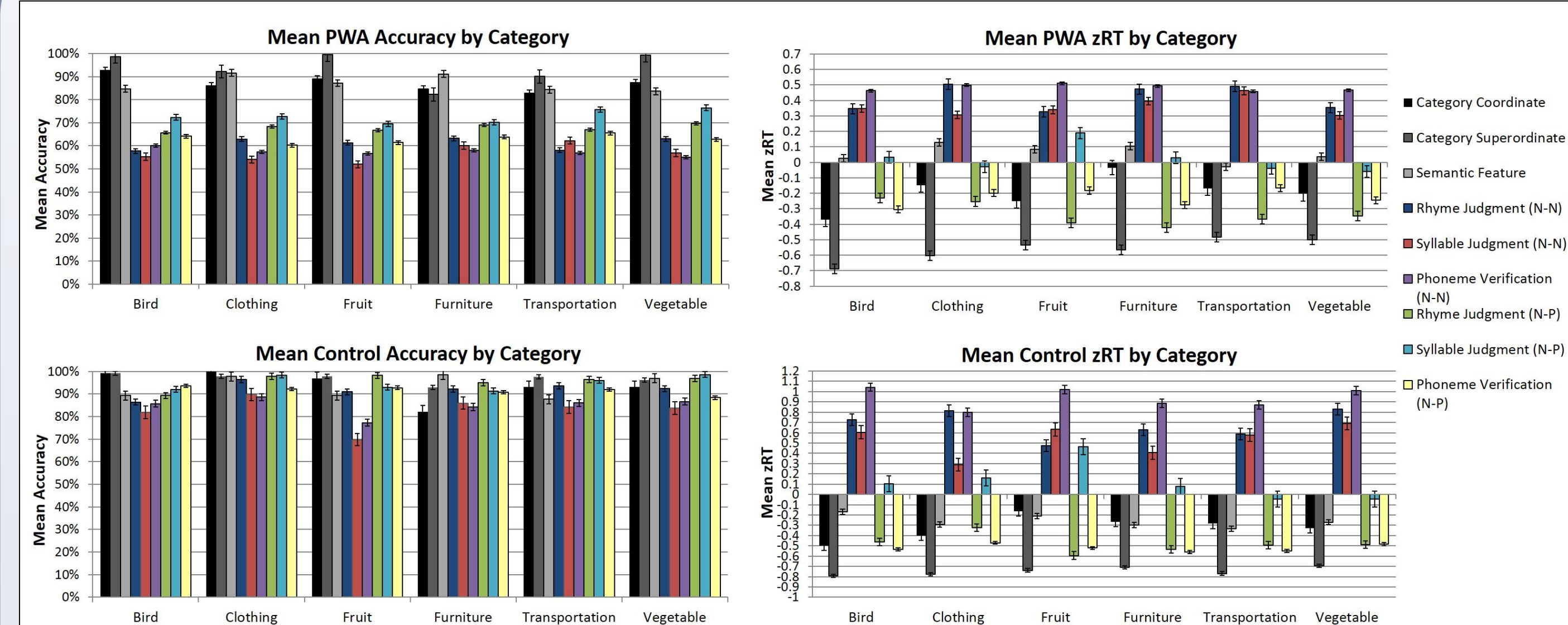
- No significant differences between groups on the SEM tasks ($F(3,37) = 2.09, p = n.s.$)
- PWA significantly less accurate than controls for PN-N ($F(3,36) = 20.94, p < .001$) and PN-P task types ($F(3,36) = 14.56, p < .001$) across all tasks (all at $p < .001$ level)
- Significant main effect of group across all task types (SEM: $F(3,37) = 15.92, p < .001$; PN-N: $F(3,33) = 13.02, p < .001$; PN-P: $F(3,36) = 12.30, p < .001$) with PWA significantly slower than controls to respond across all nine tasks (all at $p < .001$ level)
- Overall, PWA were significantly less accurate than controls on the phonological but not semantic tasks while PWA were slower to respond than controls across all nine tasks
- Despite group differences in accuracy and RT, similar trends in task performance within each group can be observed

RQ2: How do task demands influence processing within each group?

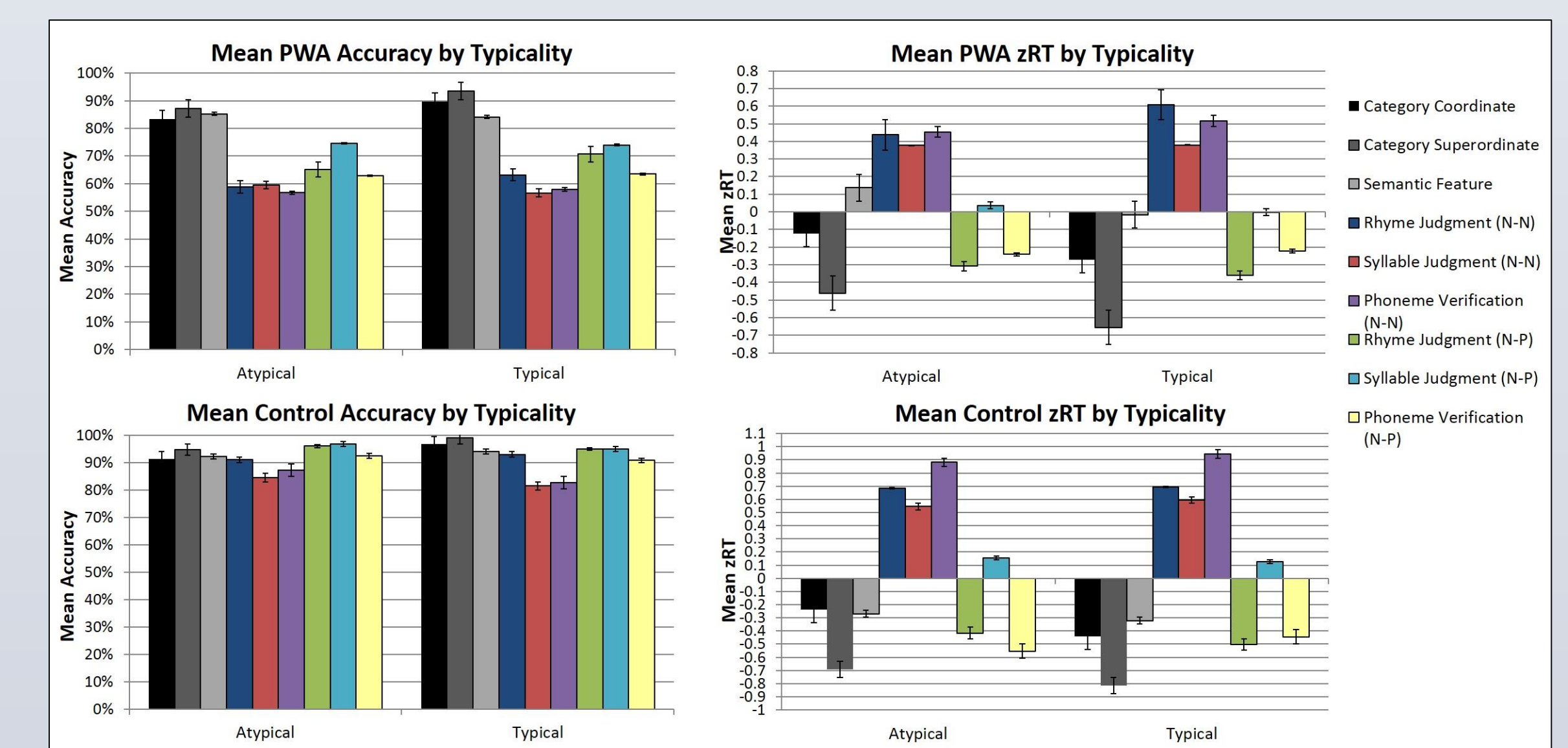


- PWA:** separate clusters for SEM & PN tasks
- Controls:** Most tasks (excluding two PN-N tasks) contained within a single cluster
- PWA:** Three PN-N tasks contained within a single cluster while SEM and PN-P tasks clustered together
- Controls:** Clustering similar to PWA
- For PWA, accuracy was highest for SEM tasks and lowest for all PN tasks; for controls, accuracy also was high for SEM tasks with comparable accuracy on four of six PN tasks
- Both groups required more time to make judgments when lexical access, phonological processing and segmentation were required (i.e., as in the PN-N tasks)

RQ3: What are the effects of category and typicality on processing across all tasks?



- Significant main effect of category on accuracy for PWA ($F(15,540) = 5.66, p < .001$) and controls ($F(15,162) = 5.07, p < .001$) for SEM tasks only
- No significant effect of category on reaction time for any of the nine tasks for either group



- Typicality effect was significant for PWA ($F(3,58) = 4.37, p < .001$) and approached significance for controls ($F(3,16) = 3.18, p = .052$) for SEM tasks only
- Item typicality significantly impacted reaction time for PWA ($F(3,58) = 2.78, p < .05$) for SEM tasks only
- No typicality effect observed in controls
- In each group, category and typicality effects were observed in SEM tasks only

CONCLUSIONS

- PWA experienced the most ease with tasks requiring semantic processing but struggled to successfully complete tasks that required any level of phonological processing
- For both groups, the semantic variables (i.e., category and typicality) impacted processing only in tasks that explicitly required a semantic judgment
- These results appear to align best with the framework of discrete serial models of lexical processing; however, the locus of PWA's impairments and the nature of the experimental tasks must be considered:
 - PWA's anomia rendered the PN-N tasks the most difficult of the three task types, but PWA also struggled with tasks that just required phonological manipulation and segmentation (i.e., PN-P tasks)
 - The challenge of segmenting the targets in the PN-N tasks may have overridden the effects of the inherently semantic variables of category and typicality
- Further study including a semantic (no-name) condition that also examines the effects of phonological factors on semantic processing may further elucidate the discrete or interactive processes involved with lexical processing in PWA

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