Thus, the purpose of this investigation was to understand the literacy skills of children with ASD. Researchers examining the literacy skills of children with ASD have focused mostly on the contributions spoken language makes to reading comprehension after accounting for word-level reading (e.g., Lucas & Norbury, 2014, 2015). However, other potentially important skills, such as linguistic awareness, the ability to consciously think about and manipulate language, has received less attention. Although linguistic awareness skills have been found to be important for literacy in children who are typically-developing and those with developmental delays (e.g., Apel & Henbest, 2016; Roman, Kirby, Parrilla, Wade-Woolley, & Deacon, 2009), few studies have examined the linguistic awareness skills of elementary-school children with ASD (e.g., Nash & Arciuli, 2016; Smith-Gabig, 2010) and they have resulted in mixed findings.

Thus, the purpose of this investigation was to understand the relations between phonological awareness, prosodic awareness, orthographic knowledge, and morphological awareness and word-level reading, reading comprehension, and spelling in children with ASD.

RESEARCH QUESTION
What are the relations between phonological awareness, prosodic awareness, orthographic knowledge, morphological awareness, and word-level reading, reading comprehension, and spelling in school-age children with ASD?

METHOD

Participants
N = 17; 10 in Grade 2, 1 in Grade 3, 1 in Grade 4, 4 in Grade 5, 1 in Grade 6
14 males; 3 females
6 African American, 10 Caucasian, 1 multi-racial

RESULTS

The children performed within the average range on the reading and spelling measures although below the mean (100) on all tasks. Considerable variability in performance was observed. There were no differences in the children's performance on the reading and spelling measures (p > .21)

METHOD (continued)

Tasks
- Descriptive Measures
  - Autism Diagnostic Observation Schedule (ADOS-2)
  - Clinical Evaluation of Language Fundamentals-5th edition (CELF-5) Formulated Sentences
  - Test of Non-verbal Intelligence-4th Edition (TONI-4)
  - Peabody Picture Vocabulary Test-4th Edition (PPVT-4)

Outcome Measures
- Woodcock Reading Mastery Tests-Third Edition (WRMT-3)
  - Word Identification
  - Word Attack
  - Passage Comprehension
- Test of Written Spelling-Fifth Edition (TWS-5)

Linguistic Awareness Measures
- Phonological Awareness
  - Comprehensive Test of Phonological Processing-2nd Edition (CTOPP-2) Elision and Blending subtests
- Prosodic Awareness
  - Mispronunciation task (e.g., “PAPER to pAPER”; Nash & Arciuli, 2016)
  - Compound Noun task (e.g., “breast stick and eggs” or “bread, stick, and eggs”; Goodman, Libenson, & Wade-Woolley, 2010)
- Orthographic Knowledge (OK)
  - Lexical: Orthographic-Choice task (e.g., cir-act-circ-icle; Olson et al., 1994)
  - Sublexical: Word-Likeness task (e.g., seedle-seedl; Treiman, 1993)
- Morphological Awareness
  - Affix Identification Task (e.g., blopperly; Apel, Diehm, & Apel, 2013)
  - Spoken relatives task (e.g., “Farm. My uncle is a ___”; Carlisle, 2000)

RESULTS (continued)

Measure | Score | Standard Deviation | Range
--- | --- | --- | ---
CELF Formulation Sentences | 6.03 | 3.21 | 1-10
TONI-4 | 103.20 | 18.30 | 79.128
PPVT-4 | 95.02 | 17.60 | 71.438
WRMT-3: Word Identification | 94.02 | 19.06 | 56-118
WRMT-3: Word Attack | 93.53 | 19.33 | 64-126
WRMT-3: Passage Comprehension | 90.47 | 16.44 | 68-139
TWS-5 | 80.00 | 24.46 | 45-128
CTOPP-2: Elision | 7.68 | 3.23 | 1.10
CTOPP-2: Blending | 0 | 2.78 | 0-5
Mispronunciation Task (1* - 2*) | .52 | .50 | 0.1
Mispronunciation Task (2* - 1*) | .49 | .23 | 0.1
Compound Noun Task | 12.24/20 | 7.77 | 0-19
Orthographic-Choice Task | 5.01/20 | 6.00 | 0-15
Word-Likeness Task | 12.44/20 | 4.04 | 0-15
AIDS Identification | 7.82 | 4.09 | 0-15
Spoken Relatives | 10.89/20 | 8.80 | 0-20

Note: N = 16 for CELF Formulation sentences. For CELF and CTOPP, scaled score has a mean = 7 with a standard deviation of 3. Mispronunciation task scores are presented as a percentage. Standard scores are presented for standardized measures.

DISCUSSION

Multiple linguistic awareness skills appear to be important for reading and spelling in school-age children with ASD. Moderate positive correlations were found between one or more measures of phonological awareness, prosodic awareness, orthographic knowledge, morphological awareness, and the reading variables.

Interestingly, the Compound Noun Task was not related to any of the outcome measures, which is in line with previous investigations (Nash & Arciuli, 2016). However, the Mispronunciation Task, which required sensitivity to reversed stress from the first to second syllable of a word, was related to all literacy measures. As expected, the measures of morphological awareness were related to real-word reading and reading comprehension, but not pseudo-word reading. Notably, sublexical OK was strongly related to spelling performance.

These results suggest that task types within differing linguistic awareness domains matter when measuring these skills in school-age children with ASD.