

## Title: Examining the Equivalence of Two Semi-structured Natural Language Protocols

Background: Natural language sampling (NLS) provides an excellent context for assessing expressive language and communication skills (Barokova & Tager-Flusberg, 2018; Tager-Flusberg et al., 2009). Two elicitation protocols, ELSA-A (Eliciting Language Samples for Analysis; designed for ages 4-20 years) and ELSA-T (Eliciting Language Samples for Analysis-Toddler Version; designed for ages 18 months-7 years), were developed to collect natural language samples from younger children to adolescents with ASD who vary in their language abilities and symptom profiles. Our previous work supports the success of ELSA-A at eliciting language as indexed by utterance frequency and conversational turns. However, the comparability of these two language elicitation protocols remains unexamined. For treatment and intervention studies that enroll heterogeneous participants across wide age ranges, comparable protocols are needed for pre- and post-intervention assessment to obtain outcome measures.

Objective: To evaluate the comparability of ELSA-A and ELSA-T at eliciting language from children with ASD between 4 and 7 years of age.

Methods: Seventeen children with ASD (12 males; *Age*: 62.12 months, *SD* = 9.61) were administered both ELSA-A and ELSA-T by an examiner. ELSA-A and ELSA-T each consist of 8 developmentally appropriate and structured interactive activities which are administered in a naturalistic play setting that aims to maximize the child's opportunity to use language. The activities fall into commonly used language elicitation contexts: conversation, play, and narrative. ELSA-A includes the following activities: Apple Falling, Having a Picnic, Finding Animals, Helping Animals, S'mores, Crafts, Bean Bag Toss, and Pixar Movie Shorts. ELSA-T includes the following activities: Leaf Falling, Planting an Acorn, Discovering Animals, Snack, Crafts, Turtle Bean Bag Toss, and Storytime. Both protocols are highly parallel in structure and content, and can be adapted to suit the cultural needs of each individual. Standardized measures of communication and intelligence were also used: Vineland Adaptive Behavior Scales-3 and Leiter-3 (Table 1). We compared the two language elicitation protocols by deriving quantitative measures of linguistic communication using ELAN Linguistic Annotator (Lausberg & Sloetjes, 2009): these included participant utterance frequency and conversational turns per minute, and time to administer. Each activity within ELSA-A and ELSA-T was also compared on these measures. Paired samples t-test was used to determine whether there were differences in these quantitative measures between ELSA-A and ELSA-T overall and between each activity. Results were corrected for multiple comparisons.

Results: When comparing ELSA-A and ELSA-T, there were no differences in frequency of utterances per minute,  $t(16) = -1.700, p = .108$ , frequency of conversational turns per minute,  $t(16) = -1.969, p = .067$ , and the time to administer each protocol,  $t(16) = 1.444, p = .168$  (Table 2). When comparing each ELSA-A and ELSA-T activity (Figure 1), no differences were found in frequency of utterances per minute (Table 3) and frequency of conversational turns per minute (Table 4). The activities that elicited the fewest and most utterances per minute and conversational turns per minute were corresponding across protocols (e.g., book reading and Pixar movie shorts). The same analyses were conducted for examiner frequency of utterances and conversational turns per minute, and similar results were obtained.

Conclusion: Findings provide support for the equivalency of these language elicitation protocols. These protocols can be easily adapted using different types of culturally appropriate materials and can be tailored by researchers to suit a variety of different contexts. These two protocols can document changes in expressive language equally well, and the same version can be used pre- and post-intervention to compare groups on pre- and post-outcomes, regardless of the ELSA version they were administered. Lastly, the protocols can be administered to individuals who vary in their age range, and who present with differing language and communication profiles.

**Table 1.** Participant Characteristics

Characteristic	Sample
N	17
Chronological age, months <i>M(SD)</i>	62.12 (9.61)
Male, n (%)	12 (71%)
Leiter IQ standard score <i>M(SD)</i>	101.00 (8.21)
Vineland Adaptive Behavior Standard Score <i>M(SD)</i>	77.40 (15.19)
Vineland Communication Standard Score <i>M(SD)</i>	79.47 (22.65)
Vineland Socialization Standard Score <i>M(SD)</i>	75.87 (14.28)
ADOS Overall CSS <i>M(SD)</i>	5.94 (1.60)

Note: ADOS = Autism Diagnostic Observation Schedule; CSS = calibrated severity scores (range from 1 to 10, with higher scores indicating more severity).

**Table 2.** Participant's Linguistic Communication by Elicitation Protocol

	ELSA-A M (SD) Range	ELSA-T M (SD) Range
Utterance Frequency per Minute	5.74 (3.00) .64-11.70	6.61 (3.32) 1.51-13.45
Conversational Turns per Minute	4.94(2.53) .51-9.88	5.58 (2.52) 1.39-10.46
Duration (minutes)	22.81 (4.18) 15.66-29.06	21.27 (4.47) 13.52-30.53

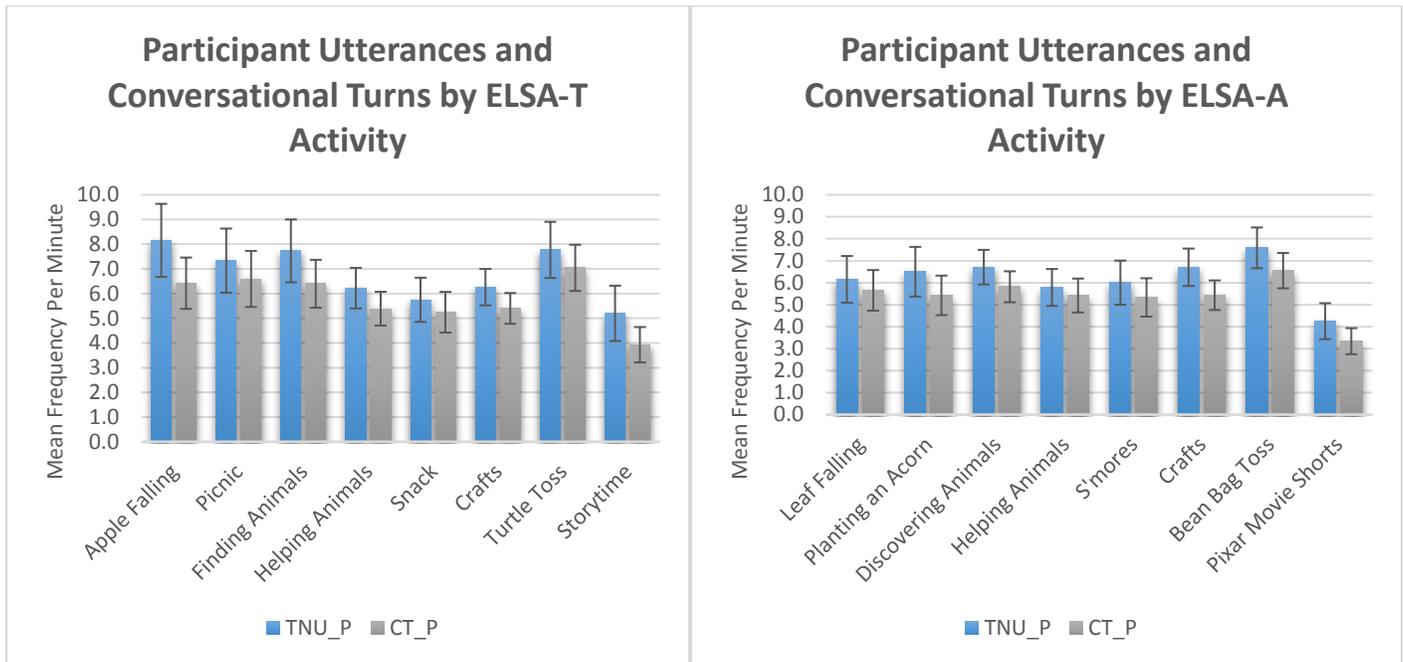
**Table 3.** Participant Utterance Frequency per Minute: ELSA-A & ELSA-T Activity Comparison

Activity Comparison	T value	Sig. Value
Leaf Falling vs Apple Falling	1.705	.108
Planting an Acorn vs Having a Picnic	.931	.366
Discovering Animals vs Finding Animals	1.028	.319
Helping Animals vs Helping Animals	.507	.619
S'more vs Snack	-.203	.842
Crafts vs Crafts	-.576	.573
Bean Bag Toss vs Turtle Bean Bag Toss	.418	.682
Pixar Movie Shorts vs Storytime	.952	.355

**Table 4.** Participant Conversational Turn Frequency per Minute: ELSA-A & ELSA-T Activity Comparison

Activity Comparison	T value	Sig. Value
Leaf Falling vs Apple Falling	.865	.400
Planting an Acorn vs Having a Picnic	1.402	.180
Discovering Animals vs Finding Animals	.711	.487
Helping Animals vs Helping Animals	-.047	.963
S'more vs Snack	.220	.829
Crafts vs Crafts	-.060	.953
Bean Bag Toss vs Turtle Bean Bag Toss	.895	.385
Pixar Movie Shorts vs Storytime	1.042	.313

**Figure 1.**



Note: n = 17; TNU P = participant utterances; CT P = participant conversational turns.