

In Pursuit of the Golden Egg:  
Utility of Difference Scores in an Observational Social Skill Assessment

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INTRODUCTION

Theoretically, subtracting two measured variables creates a separate construct (i.e., difference score), and these simple difference scores have been used in a variety of contexts: measurement of discrepancy in informant reports (De Los Reyes et al., 2011), implicit biases (Birmingham et al., 2015), pre/post analyses (White et al., 2015), and differential negativity in Event-Related Potential analyses (Meyer et al., 2017), among others. However, this computed score may not offer more utility than that of its comprising terms (Laird, 2020), prompting researchers to replace difference scores with variable interaction terms to further analyze the relationships among identified variables/informants (Laird & De Los Reyes, 2013). Nonetheless, the search for the proverbial ‘Golden Egg’ continues, and instances may arise where difference scores can be interpreted as meaningful data; for example, as designed by a measure evaluating behavioral change in a social conversation (Ratto et al., 2011).

**Objective:** Examine the use of difference scores and their potential to contribute unique clinical utility as a metric of social competence

METHODS

- Fifty adolescents with ASD enrolled in a multi-site randomized controlled trial examining the efficacy of a theatre-based intervention in improving social competence in youth with ASD

Participant Demographics

- Aged 10 – 16 (*M* = 12.73, *SD* = 1.88)
- Primarily Caucasian (86%)
- Mean FSIQ = 98.08; *SD* = 18.72
- Primarily male (60%)

Measures

- Contextual Assessment of Social Skills (Ratto et al., 2011): video-taped laboratory-based assessment of conversational ability consisting of two conversations with trained confederates sequentially acting interested (CASS-I) and bored (CASS-B). Trained raters code 9 items assessing conversational skill, each rated on a a 7-point scale by trained coders (ICC for each of the 9 items: .75-.98)
  - 4-item CASS-I composite and CASS-B composite: # questions asked, # topic changes, overall involvement, and overall quality of rapport, calculated as *z* scores and totaled
  - Social Adaptation Index (SAI): reflects differences in participants’ behavior (i.e., CASS-I – CASS-B composite scores)

METHODS, Continued

Social Behavior Outcome Measures

- Social Responsiveness Scale, 2<sup>nd</sup> Edition (SRS-2; Constantino & Gruber, 2012): Social Communication Index (SRS-SCI; T-score *M* = 76,62, *SD* = 9.32, Range = 54 – 90)
- Autism Diagnostic Observation Schedule-2nd ed. (ADOS-2, Lord et al., 2012): Social Affect Index (ADOS-SA; *M* = 9.27, *SD* = 4.24, Range = 4 – 19)

Data Analyses

- CASS-Avg created by averaging CASS-I and CASS-B
- Unstandardized residuals were saved predicting CASS-I from CASS-B and CASS-B from CASS-I using linear regression (Meyer et al., 2017)



The SAI, derived as a difference score, may offer unique clinical utility in measuring social behavior during the CASS laboratory-based observational assessment.

RESULTS, Continued

- Bivariate Correlations presented in Table 1
- SAI significantly related to CASS-I<sub>resid</sub> (*r* = -.78, *p* < .001) and CASS-B<sub>resid</sub> (*r* = .96, *p* < .001), in opposite directions as expected
- CASS-B accounted for more variance in SAI (*r* = .63, *p* < .001) than did CASS-I (*r* = -.28, *p* = .094; Fisher *r* to *z*, *p* < .05),
- CASS-I was significantly related to ADOS-SA (*r* = -.34, *p* = .043), indicating clinical utility as a metric of social behavior
- CASS-B, SAI, and CASS-Avg were not related to social behavior

DISCUSSION

- Bivariate correlations support only the utility of CASS-I as a metric of social behavior, given its association with ADOS-SA
  - Interpretation of CASS-I is complex, given computation of SAI (i.e., # questions asked + # topic changes + overall involvement – overall rapport = composite score)
  - Questionable clinical utility in interpreting CASS-B (participant response to a bored confederate); reflects social cognition
- CASS-B contributed to behavioral change (SAI), distinct from CASS-I
- The SAI, derived as a difference score, may offer unique clinical utility in measuring social behavior, reflecting increased effort with a bored conversation partner relative to a more interested conversation partner

Implications

- Alternative approaches to difference scores (e.g., polynomial regression analysis, Laird & De Los Reyes, 2013) may further speak to the value of the Social Adaptation Index
- Continued examination of the CASS (CASS-I, CASS-B, SAI) and its relation to indices of social behavior and/or other outcomes (e.g., adaptive functioning) will speak to the utility of the SAI as a unique metric of social behavior

RESULTS

Table 1. Bivariate Correlations (*r*) of Variables of Interest

	SAI	1	2	3	4	5
1. CASS-I	-.28					
2. CASS-I <sub>resid</sub>	-.78***	.82***				
3. CASS-B	.63***	.58***	0.00			
4. CASS-B <sub>resid</sub>	.96***	0.00	-.58***	.82***		
5. CASS-Avg	.25	.86***	.41*	.91***	.51***	
<i>Measures of Social Behavior</i>						
6. SRS-SCI	-.16	-.07	.05	-.20	-.19	-.16
7. ADOS-SA ( <i>n</i> = 48)	.10	-.34*	-.28	-.19	0.00	-.29

Notes. \**p* < .05, \*\**p* < .01, \*\*\**p* < .001; Benjamini-Hochberg (1995) correction for 27 multiple comparisons

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Supported by funding from the National Institutes of Health: Project ID R01MH114906, Blythe Corbett, PI

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