Assessing the Relationship between Executive Function and Social Skills in Young Children

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Abstract

This study examined the relationship between prosocial verbal displays, executive function and social skills of 82 preschool children in three private schools, representing three different learning environments: a Classical School, a Catholic school, and a Montessori school. The students were administered two NIH Toolbox executive function measures and the Reverse Rouge Test. The children's teachers completed the Social Skills Improvement System Scale on each student participating in the study. Prosocial verbal displays were predicted by the social skill of communication. Children who scored higher in communication were less likely to lie during the Reverse Rouge Test.

Introduction

Reverse Rouge Task has been used to assess the emergence of white lie telling in children, particularly in children who already possessed skills to lie successfully. Previous research on the subject has suggested that self preservation was the primary reason for children to tell a white lie, though researchers are still debating how intention behind a lie impacts children's verbal behavior. Children have been shown to be more likely to lie and spare the recipient a hurtful truth if they (a) are able to understand how the other person will feel about their statement (theory of mind); and (b) care about the wellbeing of the recipient. Therefore, this study employed methods similar to the Reverse Rouge Test Rouge to assess children's willingness to lie as well as an executive function measures and social skills assessments.

Descriptive Statistics for Variables in Model

Description	Frequency (*N=82*)	*M (SD)*	Percent Missing
Sex			
Male	48%		
Females	48%		
Missing	5%		
Lying Status			
Did not lie	20%		
Lied	76%		
Missing	4%		
Environment			
Catholic	27%		
Classical	34%		
Montessori	37%		
Missing	2%		
Age		5.1 (0.8)	4%
Flanker Store		103.8 (11.3)	10%
Card Sort Score		101.5 (12.9)	12%
Social Skills		125.5 (170.0)	1%
Communication		13.7 (4.0)	1%
Cooperation		11.4 (4.0)	1%
Assertion		13.4 (2.9)	0%
Responsibility		11.6 (3.9)	1%
Empathy		11.1 (3.9)	1%
Engagement		13.5 (3.6)	1%
Self Control		12.2 (4.5)	1%
Problem Behaviors		138.0 (167.2)	1%
Externalizing		8.6 (6.7)	1%
Bullying		2.0 (2.4)	1%
Hyperactivity		7.1 (4.7)	1%
Internalizing		3.6 (2.8)	1%

Methods

In the spring of 2019, the principle investigators and six graduate students formed a research team and conducted the project. Prior to administering the assessments, the research team members completed the NIH Toolbox training and practiced administering each measure of executive function to each other until implementation fidelity of 90% or greater was reached. The research team members also practiced the Reverse Rouge Test until all members reach 90% implementation fidelity. Following IRB approval and consent from families, assessments in the schools began; each assessment required two researchers. The order of testing for all sessions was: NIH Toolbox Dimensional Change Card Sort Test, NIH Toolbox Flanker Inhibitory Control & Attention Test, and the Reverse Rouge Test.

NIH Toolbox –The two Executive Function assessment tools, NIH Toolbox Flanker Inhibitory Control & Attention Test and the NIH Toolbox Dimensional Change Card Sort Test were administered to the preschool students. Both tests were administered using an iPad, and the estimated completion time per student was 7 minutes.

Reverse Rouge Test – Using the Reverse Rouge Test, the experimenter had a conspicuous mark of lipstick on their nose. The child was asked to take a picture of the experimenter, but before the picture was taken the experimenter asked, "Do I look okay for the picture?"

Social Skills Improvement System Scale – The Social Skills Improvement System Scale measures social skills by assessing the frequency and importance of positive behaviors while also assessing problem behaviors that may serve as barriers to prosocial behavior. The problem behavior scales include measures of internalizing and externalizing behaviors as well as measures of attention.

The relationship between environment and social skills, executive function, and prosocial verbal displays was tested using descriptive statistics and chi-square. Descriptive statistics were used for the continuous variables—social skills and executive function— and chi-square was used to analyze associations between categorical variables. The chi-square analysis allowed us to reduce the number of predictors in our analysis; sex, age, and school type demonstrated no association with telling white lies and were not used in future analyses.

We used logistic regression to predict if a child would lie under the Reversed Rouge Test scenario. The subscales for SSIS were used as predictors and all assumptions for logistic regression were met.

Selected References

Anderson, P. (2002). Assessment and development of executive function (EF) during childhood. *Child Neuropsychology*, *8*(2), 71-82.

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Results

We conducted descriptive statistics using SPSS (*v*.26). Descriptive statistics by group demonstrated very few differences. No statistical differences were found between sex and prosocial verbal displays, χ^2 (1) = .16, p = .694, or environment and prosocial verbal displays, χ^2 (2) = 2.18, p = .337. Age was also not significantly related to prosocial verbal displays, χ^2 (4) = 1.57, p = .815. These variables were excluded from the regression analysis as they do not appear to be related to prosocial verbal displays.

Flanker scores were normally distributed and were used in the logistic regression model conducted in M*plus* (*v*.8.0). Maximum likelihood estimator and Monte Carlo integration was used to estimate the regression equation. Missing data were handled through full information maximum likelihood. The odds ratios for each predictor were as follows: Flanker = 1.00, Communication = 0.79, Self-Control = 1.10, and Empathy = 1.11. The logistic regression equation predicted 12% of the variance in prosocial verbal displays, and the only significant predictor was Communication.

Group Descriptive Statistics

	Flanker	Card Sort	Communication	Self-Control	Empathy
Sex					
Male	103.5	101.1	13.1	11.4	9.8
Female	102.5	100.5	15.2	13.9	12.5
Prosocial Verbal Display					
Yes	104.0	101.4	13.7	12.6	11.1
No	101.1	100.9	15.3	12.2	10.8
Environment					
Montessori	98.0	99.4	13.5	13.1	12.4
Classical	105.8	102.9	14.5	13.9	11.6
Catholic	103.6	99.4	14.3	10.9	9.7

Discussion

Communication was significantly related to prosocial verbal displays or white lies, but the direction of the relationship was negative indicating that children who scored lower on communication were more likely to exhibit prosocial verbal displays. The odds ratio for Communication means children who used prosocial verbal displays scored approximately 21% lower than those who did not.

While not significant, the effect sizes for Empathy and Self-Control are noteworthy. Children who used prosocial verbal displays scored higher in both social skills by 11% and 10% respectively. These effects are consistent with past research and may have been stronger in the current study if measured directly, rather than with teacher reports.

Executive function did not predict prosocial verbal displays as suggested by prior research. Since we used the Flanker task as our executive function measure, we have only captured some of the variance associated with lying—specifically variance associated with attention.