

Early Life Environmental Factors, Impulsivity, & Inflammation in Children

Tori Short, Summer Mengelkoch, Jeff Gassen, M.S., & Sarah E. Hill, Ph.D.

Department of Psychology, Texas Christian University

INTRODUCTION

- Impulsivity is known as the degree to which one is unable delay gratification, exercise self control, or regulate behavior
- Research has shown children exhibiting high impulsivity have greater difficulties with learning (Donfrancesco, Mugnaini, & Dell'Uomo, 2005)
- Studies with adults have also revealed that those with higher levels of inflammation act more impulsively (Gassen et al., 2019)
- Current research aims to examine impact of early life environmental factors on inflammation, and inflammation on learning, memory, and impulsivity in children and the potential early life physiological and environmental predictors

STUDY METHODS

Participants: $N = 238$ kids, ages 3-16 ($M_{age} = 8.06$, $SD = 2.55$), and their parents were recruited from the Research & Learning Center (RLC) at the Fort Worth Museum of Science and History

Procedure:

- Parent/legal-guardian completed questionnaires assessing variety of child/personal experiences and family environmental and socioeconomic measures
- Child provided saliva sample in order to assay for pro-inflammatory cytokine, interleukin-6 (IL-6), to indicate levels of immune activation

Dependent Measures:

- Barrett Impulsivity Scale (BIS)
- Sun/moon game: inhibiting responses i.e., saying 'night' instead of 'day' when prompted with a picture of the sun
- Memory game: exercising spatial working memory
- Marshmallow Test: delaying gratification for a larger reward

PROPOSED STATISTICAL MODEL

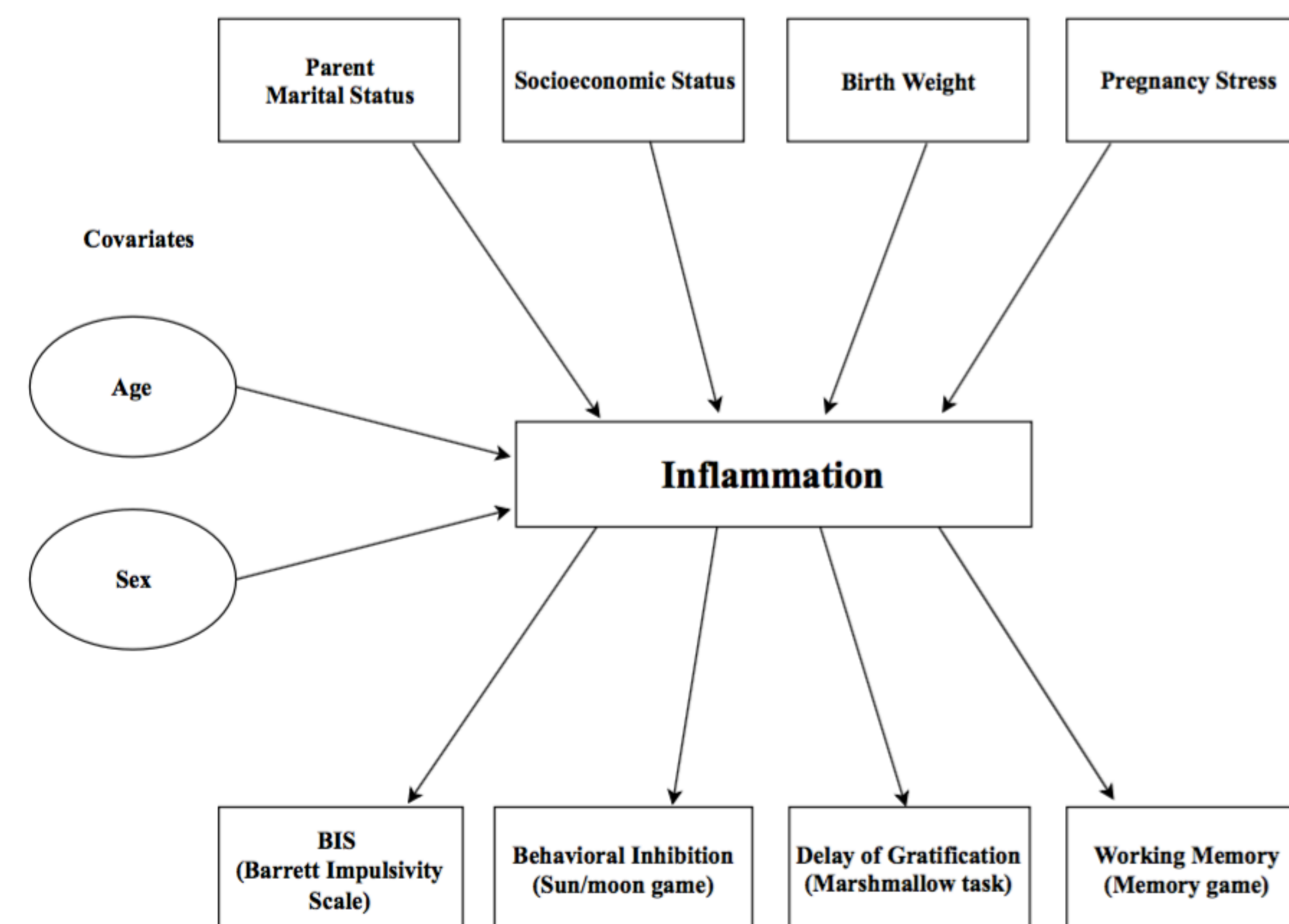


Figure 1. Proposed SEM statistical model representing relationships between early life factors i.e., parents' marital status, socioeconomic status, child's birth weight, and pregnancy stress on child's levels of inflammation and subsequently on tasks measuring impulsivity, self control, inhibition, and working memory while controlling for child's age and sex.



PRELIMINARY RESULTS

- Saliva is still in the process of being analyzed for levels of inflammation
- So far, we have found some trending relationships between early life environmental factors and impulsivity, although they do not reach significance
- We expect that inflammation will mediate the relationship between early life environmental factors and inflammation, learning, and memory

Table 1		BIS	Sun/moon game	Memory game	Marshmallow test
Correlations					
Parents' marital status	r	.019	-.098	.057	-.098
	p -value	.785	.148	.401	.151
Socioeconomic status	r	-.120	.063	.048	-.084
	p -value	.081	.362	.486	.222
Birth weight	r	-.148	-.033	-.089	.056
	p -value	.068	.689	.271	.494
Pregnancy stress	r	-.128	.016	-.027	.034
	p -value	.077	.827	.709	.645

Table 1. Without data on children's levels of inflammation, there are no significant correlations between early-life predictors (parents' marital status, SES, birth weight, and pregnancy stress) and impulsivity or performance on cognitive tasks (BIS, sun/moon game, memory game, and the marshmallow test). However, the correlations do show potential trends between lower SES, lower birth weight, and higher pregnancy stress and higher impulsivity.

CONCLUSIONS

Understanding how and when early life environmental factors influence inflammation, as well as how inflammation impacts impulsivity, could help us to develop health-based interventions to not only improve children's performance at home and school but also their trajectories for impulsivity in later life.

REFERENCES

- Donfrancesco, R., Mugnaini, D., & Dell'Uomo, A. (2005). Cognitive impulsivity in specific learning disabilities. *European Child & Adolescent Psychiatry*, 14(5), 270-275.
- Gassen, J., Prokosch, M. P., ... & Hill, S. E. (2019). Inflammation predicts decision-making characterized by impulsivity, present focus, and an inability to delay gratification. *Nature: Scientific Reports*, 9:9428.



Inflammation is the immune system's response that protects us from injury and infection, however inflammation may also have behavioral and cognitive effects. Previous research has found that adults with higher levels of inflammation act more impulsively, have a harder time learning new things, and are less able to delay gratification. The current study will examine the early life predictors of inflammation, and the impact of inflammation on children's memory, learning, and impulsivity. We predict that children with more immune activation will be more impulsive and perform worse on our working memory and learning tasks.

