Sam's First Manuscript in LaTeX

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Author Note

These are the notes that I will put in my thesis

Abstract

The abstract of my thesis will go here. It will include details from the intro, methods, results and discussion.

Keywords: Cognitive Control, Event-Related Potential, Alcohol

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Introduction

Cognitive control is thought to support adaptive behavior by overcoming automatic, impulsive responses. Longstanding theoretical models propose cognitive moderates the relationship between automatic impulses and later behavior Diamond (2013). This is also assumed in neural measures, with the P300 event-related potential (ERP) often used to quantify cognitive control. However, no studies have directly tested this moderation. What is also unclear is how this assumed relationship is altered in features associated with deteriorated cognitive control, such as among impulsive individuals and those who engage in heavy or uncontrolled alcohol use. Heavy alcohol use during late adolescence (i.e., college-age) can have deleterious effects on neurological development as critical brain regions are undergoing maturation. This includes the prefrontal cortex, which is implicated in cognitive control function. Rates of alcohol use continue to remain a pervasive issue in the United States. 49.6 % (16.9 million) of Americans aged reported alcohol use in the last month. This is attributable to many sources, but namely due to the belief that drinking is a core aspect of the college experience Tan (2012). Heavy drinking in college is cause for concern due to the neuro-developmental implications. The typical college-age (18-24 years) aligns with the late adolescent period, where essential brain regions are undergoing maturation. The prefrontal cortex (PFC) is just one example of this. Impaired PFC is linked to impulsive behavior such as experimenting with alcohol and other drugs and the PFC is considered is a critical area for cognitive control function. It is also broadly theorized that correlates of cognitive control behave differently among heavy drinkers. However, this model has yet to be tested in this manner. Cognitive control functions as an umbrella of several mechanisms including response inhibition and interference control. Cognitive control is typically measured using tasks that elicit response conflict, including Simon (response inhibition) and Flanker (interference control) tasks. Simon conflict reflects the automatic tendency to respond with the hand ipsilateral to a stimulus regardless of the correct response18,19. Flanker conflict occurs when irrelevant flanking stimuli indicate

a response unrelated to the target stimulus. Few studies have examined how different cognitive control mechanisms interact and no studies have explored this interaction in the context of clinical features such as hazardous alcohol use or impulsivity.

Method

Participants

- 120 college-age participants will be recruited via SONA to participate in this study.
- Participants will be compensated for their time with course credit.
- Anyone who reports history of seizure disorder, a neurodegenerative disease or past year concussion will not be permitted to participate.
- Written informed consent will be obtained before any data is collected and the study has full IRB approval.

Materials and Procedure

- After informed consent is given, participants will complete a demographics survey. Additionally, they will be asked to complete the Alcohol Use Disorders Identification Test (AUDIT) and Brief Impulsive Behavior Short Scale (I-8).
- All forms will be completed on PsyToolKit.
- After the EEG set up is complete, participants will begin a combined Simon-Flanker task on PsychoPy.
- The EEG data will be recorded continuously to record conflict processing activity throughout the task.
- The task consists of a total of 480 trials and total procedures take about 1 hour on average.

Results

This is the data analysis plan for this study. This section also includes figures from my first year project that can outline the current direction of my thesis.

- Once data collection is complete, the data will be cleaned and processed using standard protocol. Data will be processed in EEGLab via MATLAB. Difference waveforms will be calculated by subtracting the conflict conditions (SCFI, SIFC and SIFI) from SCFC.
- These difference waveforms will be used to extract pure conflict processing activity and remove other irrelevant mental processes.
- Planned statistical analyses include repeated-measures ANOVA for the different variables including LRP, P3 and reaction time. Additionally, linear mixed models will be used to test the interactions between P3 and LRP across different conflicts and conditions. Analyses will also incorporate AUDIT and I-8 scores to examine differences between heavy drinkers and highly impulsive individuals from healthy controls.
- The main analysis may simplify by focusing on Equal condition and SIFI, but exploratory analyses (TBD) will determine how AUDIT and I-8 scores relate to the different conflicts and conditions.
- The base for my thesis will be an expanded version of the theoretical model of my FYP.

Here is a table of reaction time data that I made.

Discussion

Once data collection and statistical analyses are complete, the results will be discussed here (see Table 1).

These results will advance the field in several ways. First, it will expand the current theoretical perspective regarding cognitive control using an approach that accounts for the different cognitive control mechanisms. Additionally, the outcomes of

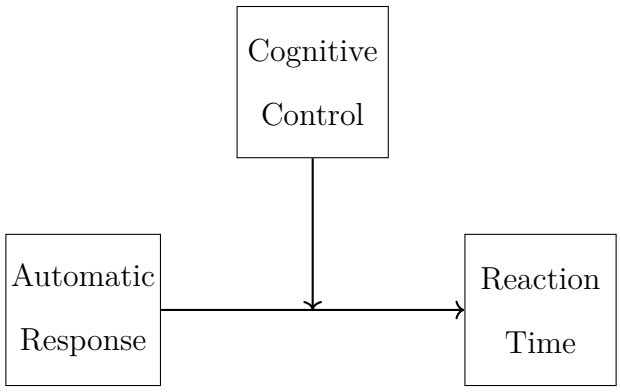

Figure 1

Here is the theoretical model that my thesis will be expanding.

Table 1

Reaction times for different Simon-Flanker conflict and PC effect conditons.

		Condition, seconds		
		Equal	Incongruent	Congruent
Conflict	SCFC	0.595	0.603	0.585
	SCFI	0.654	0.671	0.639
	SIFC	0.624	0.621	0.641
	SIFI	0.712	0.703	0.716

this study may inform of cognitive deficits among heavy drinkers prior to progression to alcohol use disorder. The use of EEG is especially important for that feature. Incorporating impulsivity is another approach to testing the external validity of this cognitive control model using a trait common in many clinical disorders. In the long-run, this study will hopefully advance the current understanding of both the neural bases of cognitive control and how alcohol use can alter this mechanism. This information can be used to inform the general public of the risks associated with alcohol use specifically during late adolescence. ERPs from this study can also be used as biomarkers for increased sensitivity for later alcohol use disorder. Overall this study will importantly clarify neural components of cognitive control as it fits with the current theoretical approach and expand the field's understanding of adolescent alcohol use and

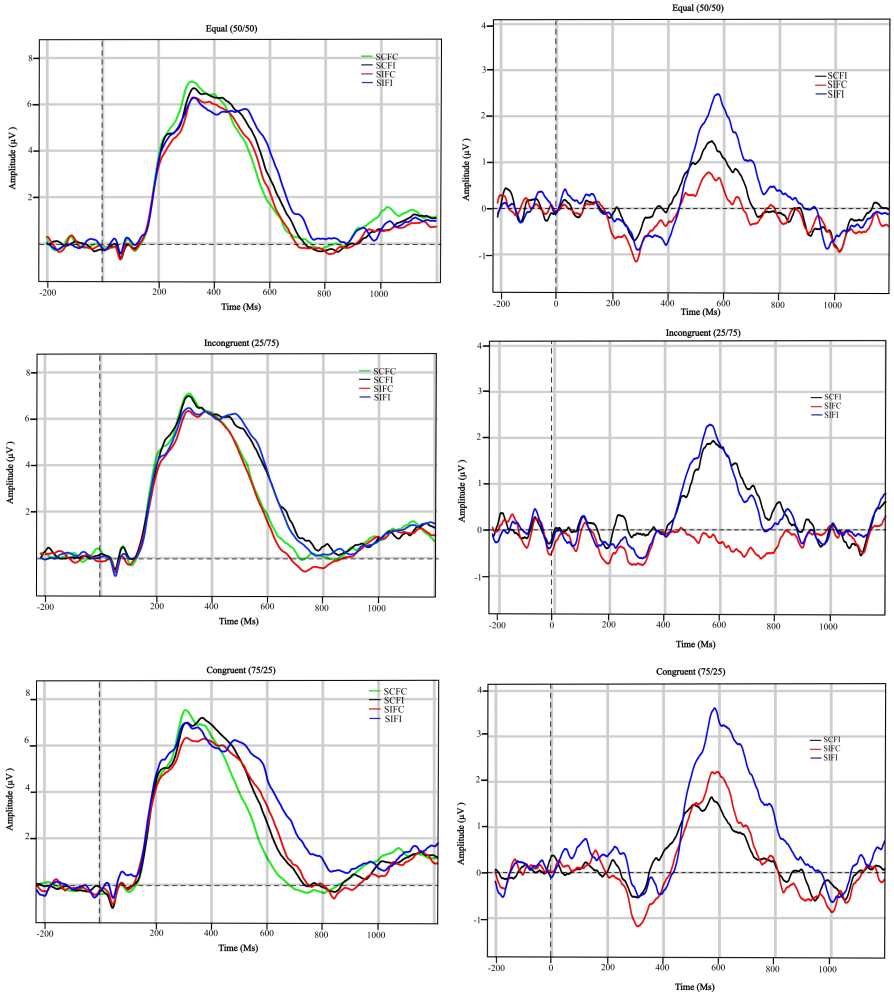

Figure 2

Here are some figures for my P3b and LRP data

impulsive behaviors.

This is a figure of the ERP scalp map. I included this as an additional figure to show how the many ways to convey EEG data in a paper.

Figure 2 This is another link to the sample data from my FYP.

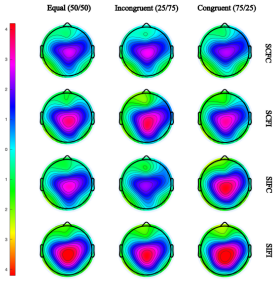

Figure 3

This figure was taken at 600 ms post-stimulus presentation .

References

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Tan, A. (2012). Through the drinking glass: An analysis of the cultural meanings of college drinking. *Journal of Youth Studies*, *15*(1), 119-142.