Investigating the Presence of Impulse Control Disorders in Adults with Aphasia

by

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ABSTRACT

Previous research of impulse control disorders, common in adults with a diagnosis of Parkinson's, were reviewed to determine possible links between impulse control disorders in in adults with aphasia. Aphasia is a disorder often caused by a stroke that can impact speech and language both receptively and expressively. Impulse control disorders (ICDs) (i.e., pathological gambling, hypersexuality, compulsive eating and shopping etc.) have drastic consequences and can cause harm to the individual affected as well as their caregivers and family. This study sought to identify if symptoms of ICDs are prevalent in adults with aphasia by utilizing self-report surveys and a Go/No-Go impulsivity computer task. The findings of this study indicate that some impulsive factors are significantly heightened in adults who have had a stroke when compared to healthy same-age peers, and that these differences are perhaps best captured by the self-report surveys. Despite a large amount of literature on the impact of stroke and quality of life, this area of impulse control has remained largely unexplored. Further investigation is warranted for the prevalence of impulse control disorders in adults with aphasia, however, this study is a step forward into understanding how aphasia and stroke affect the quality of life of those impacted.

AKNOWLEGEMENTS

I would like to express my gratitude to my advisor and chair, Corianne Rogalsky for her guidance and support throughout my graduate degree and for the opportunity to work on my research project. I would also like to thank my committee members, Elizabeth Trueba and Tamiko Azuma, for their guidance and encouragement throughout my studies. Finally, I would like to express my appreciation to Jacob Moyer and Amy Gomez Moreno for their persistence and dedication in assisting me with completing this research project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Impulse Control Disorders General Overview

Impulse control disorders, common in individuals with Parkinson's disease, are best defined by characteristics of pathological gambling, hypersexuality, compulsive eating and shopping, and more. Impulse control disorders (ICDs) have drastic consequences, in many cases impacting the financial wellness, relational stability, and mental health of those with ICD (Meyer et. Al, 2019). There is evidence to support dopaminergic treatment as a potential cause for ICD in Parkinson's patients. However, there is also evidence to support ICDs that develop due to the brain changes caused by the progression of Parkinson's disease (Meyer et. Al, 2019). It is our hypothesis that if progression of a disease such as Parkinson's can cause ICD, there may be other disorders in which ICDs are prevalent. In this study we will further explore the potential of Impulse control disorders in adults with aphasia due to stroke.

CHAPTER 2

BACKGROUND LITERATURE

Comparison of aphasia and Parkinson's disease

Aphasia is a receptive and expressive speech/language disorder that often occurs in adults who have experienced a middle cerebral artery stroke in the left hemisphere. The exact areas that are lesioned due to the stroke vary, but the insula is a frequent area of prominent lesion across all types of aphasia (fridriksson et. al, 2018). Aphasia is often a result of damage or occlusion from the middle cerebral artery, which is the arterial supply of the insula (Uddin et. Al, 2017). This aligns with lesion areas in individuals with Parkinson's Disease (Meyer et. al, 2019). Current research in the emotional regulation of post-stroke individuals in both acute and chronic stages of stroke found that there was a correlation between having a stroke and emotional regulation as well as impulse control (Cooper et. al, 2015). This study found that after a traumatic event like a stroke, it is common for a person to experience a myriad of emotions and struggle with recognizing and acting on those emotions appropriately. This is witnessed through difficulty controlling behaviors, otherwise known as impulse control (Cooper et. al, 2015).

Current research in stroke broadly points to impairments in attention and impulse control being prevalent, using a variety of experimental tasks. A study examined executive functioning and impulse behavior in frontal right-hemisphere as compared to extra-frontal right hemisphere stroke (lesion occurring in the temporal lobe, parietal lobe, cerebellum, and sub-cortical structures), (Scheffer et. al, 2016). Scheffer et. al evaluated motor and attentional impulsivity utilizing the go/no-go behavioral tasks and overall impulsivity was reported utilizing the Barratt Impulsiveness Scale 11 (BIS 11). The

performance of these tasks indicated that lesions in both frontal and extra-frontal regions seem to be involved in an individual's ability to inhibit impulsive actions. This study derived a strong pathway for further research in executive functioning and impulsivity post stroke, but they only examined right hemisphere strokes. This leaves room for discovery of other areas of the brain, including the left hemisphere that may affect impulsivity.

Scheffer et al. utilized several different tasks and surveys to measure a participant's impulsivity. Some of the tasks utilized were the Wisconsin Card Sorting Task, The Five Digits Test, The Go/No-Go task, and Delayed Discounting. These measures evaluated problem solving abilities, inhibitory control, motor control and time bound impulsivity. Additionally, this study also involved the Barratt Impulsivity Scale (BIS-11) and the Impulsivity Evaluation Scale (ESAVI). These scales are self-reporting measures that evaluate impulsivity in motor, attention, planning, cognitive control, and concentration (Scheffer et al., 2016). Findings indicated that right hemisphere strokes with frontal and extra frontal lesions appeared to have greater challenges with inhibiting impulsive behaviors and thoughts. Given these findings, possible associations may exist in individuals with aphasia between frontal and extra-frontal lesions in the left hemisphere, and this lack of control/inhibition of impulsive thoughts and actions. Thus, the possibility of impulse control disorders in adults with aphasia should be investigated. (Scheffer et al., 2016)

Additional research in aphasia has examined the emotional and social toll that a stroke plays in the life of the person with aphasia and those around them. According to Cooper et al. (2015) 28% of adults post-stroke have chronic depression and 33% of those

adults have chronic anxiety. Cooper et al. also studied emotional regulation post-stroke and how that impacts a person's everyday life. One aspect of this emotional regulation was impulse control, which Cooper et al. broadly defined as feeling out of control when experiencing negative emotions. This study found that when comparing adults with a stroke to typical controls, a vast difference appeared in emotional regulation, specifically with the following three areas: Awareness, Impulse, and Strategy. Indicating that stroke participants struggled to acknowledge what emotions they were feeling (awareness), know how to approach their actions and thoughts when feeling these emotions (impulse) and distract themselves from what they are feeling (strategy). (Cooper et al., 2015)

Go/No-Go button Task

A common laboratory test of impulse control is the "Go/No-Go" task. Go/ No-Go is a relatively simple task that can be completed by individuals with varying levels of motor and cognitive abilities. A common version of this task is a computer-generated version in which participants are trained to press the space bar on their device when presented with an orange square, while giving no response when a blue square is provided. An individual with strong impulse control will perform an action during the orange square that appears on the screen and inhibit action during presentation of the blue square. However, an individual with poor impulse control will make over generalized errors by selecting the button during both orange and blue square presentations, or undergeneralizations by not selecting the button during orange presentations. In previous studies the go/no-go task was analyzed based on the processing time each participant required across each block of stimuli. Additionally, the number of errors made were

recorded to interpret the level of motor impulsivity a participant exhibited (Scheffer et al., 2016).

Self-Reporting Impulsivity Scales

Two self-report measures of impulsivity in everyday life are the Barratt Impulsivity Scale (BIS-11) (Standford et al., 1995) and the Urgency Premeditation, Perseverance, Sensation seeking and Positive urgency Impulsive Behavior Scale- short version (UPPS-P short) (Cyders et al., 2014). The Urgency, Premeditation, Perseverance, Sensation seeking, and Positive urgency Impulsive Behavior Scale- short version (UPPS-P short) is a self-reporting measure evaluates an individual's impulsivity in 5 different facets. This scale is a valid and reliable alternative to the full version of the UPPS-P scale that offers a more manageable time commitment for all participants. (Cyders et al., 2014) For the purpose of our research, these two surveys have been combined into a form and additional questions pertinent to this study (i.e., "Have you had a stroke before", "Have you received a diagnosis for aphasia", etc.) were included to ensure ease of access for subjects and comprehensiveness of the survey. A reference of all the survey questions can be found in Appendix A–B.

Current Study

This study utilizes a combination of the go/no-go task and the aforementioned surveys to measure characteristics of impulse control disorders in adults with aphasia as compared to neurotypical healthy peers. This study seeks to discover if a correlation exists between adults with aphasia and the features of impulse control disorders.

We anticipate that adults with post-stroke aphasia diagnoses will present with some similar impulse characteristics as seen in Parkison's disease. This expectation is largely based on similar lesion/deterioration areas within the brain for both diagnoses.

CHAPTER 3

METHODS

Participants

Participants were recruited from a database at Arizona State University that included individuals who stated interest in participating in stroke related research, Facebook support groups, and distribution of study flyers at local speech therapy clinics. All methods were approved by Arizona State University's Institutional Review Board. All inclusion criteria included being 18 years or older and being able to complete the online survey and tasks. We focused our recruitment on individuals who have experienced a stroke, but also collected data on individuals who have not experienced a stroke, often the family member or care giver of the stroke participant.

Group Demographics

These efforts yielded 23 participants who have experienced a stroke and 28 participants who have not experienced a stroke. Out of the 23 stroke participants, 48% were female (See Figure 4); at least 14 participants have an aphasia diagnosis (due to an error in the survey, aphasia diagnosis information was not collected for 4 of the stroke participants) (See Figure 1). 17 participants had a stroke five or more years prior, 4 participants had a stroke within the last five years, and 2 participants had a stroke within the last three months (See Figure 2).

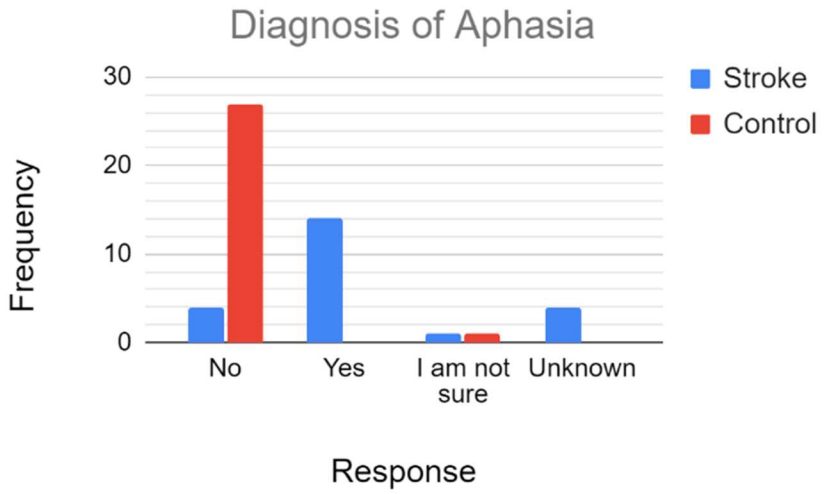

Figure 1:Diagnosis of Aphasia

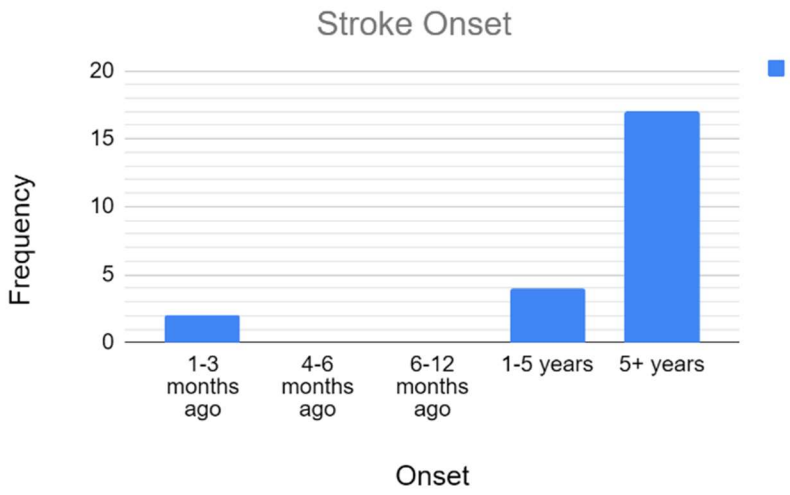

Figure 2: Stroke Onset

Of the 28 participants who did not experience a stroke, 64% were female (see figure 4). Five of those without a history of stroke were aged 20-25, eighteen participants were between the ages of 50-65, four participants were between the ages of 60-80, and one participant was above 80 years of age. The level of education of those without a stroke revealed 5 participants with a GED/Highschool experience, 3 participants with an

associate degree, 11 participants with a bachelor's degree, 7 participants with a master's degree, and 2 participants with continuing education beyond. (See Figure 5)

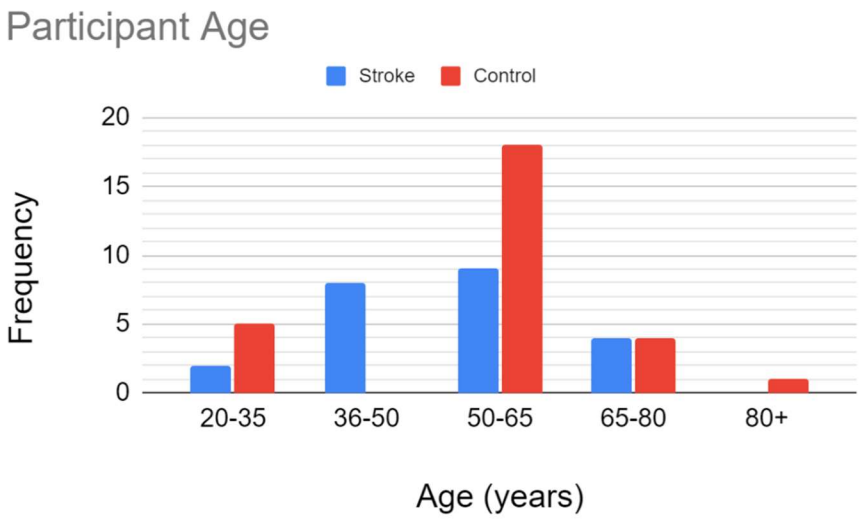

Figure 3:Participant Age

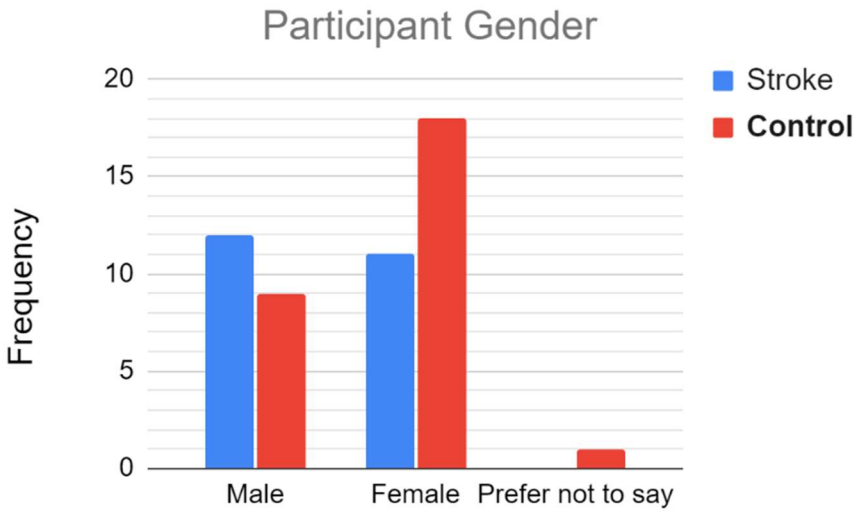

Figure 4:Participant Gender

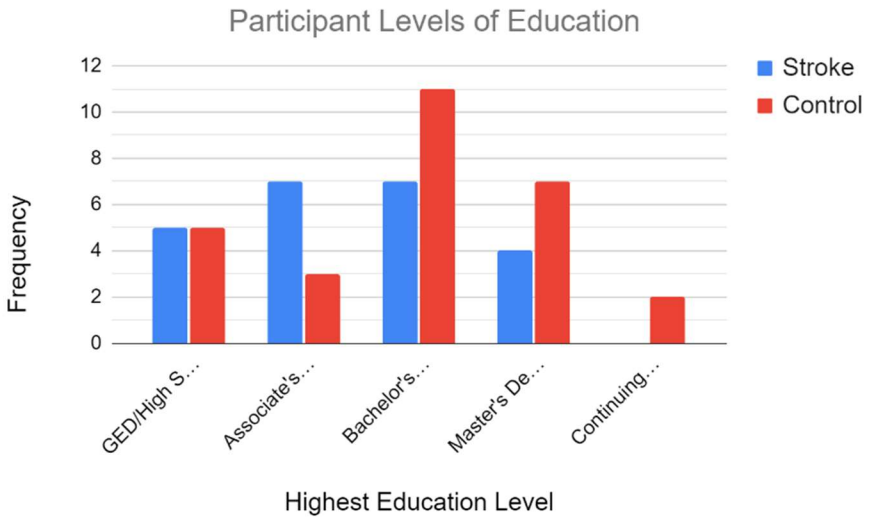

Figure 5:Participant Level of Education

Tasks

All participants completed an online survey (appendix A-B), and a Go/No-Go task online. The survey consisted of adaptations of the Barrat Impulsivity Scale and the UPPS-P (these impulsivity scales, and the go/no-go task are described in more detail below. Confidentiality was maintained by ensuring no identifiable information was obtained. However, participants were given the option to include an email address if they wanted to receive compensation for their participation (electronic gift card); 58.8% of participants chose to include an email address.

Go/No-Go Task

The Go No-Go task was adapted from a pre-existing task found on Testable.org. The instructions, prompts and length of time in which stimuli is presented were adjusted with consideration for stroke survivors and varying levels of cognition and language comprehension. The task consisted of a training task and the task itself. The task involves visualization of an orange or blue square that would appear on the screen, participants

were prompted to only press the space bar when they saw the orange square and provide no response if they saw the blue square. The test consists of a trial and test component. The trial period consists of four trial prompts; 2 go prompts indicated with an orange square and a prompt to press the spacebar and 2 no-go prompts indicated with a blue square and prompt to not respond when the blue square is visible. The training task can last as long as 25.2 seconds. The quicker a participant responds to the stimuli the training task time will decrease. If a participant responds incorrectly to the trial task a message appears explaining the instructions again. Additionally, if a participant responds correctly, they are provided with a reinforcement response. In both training task and test portion each square is shown for a maximum of 5 seconds depending on if the participant responds to each square. There was a total of 65 trials during the test task. 81% of stimuli items were "go" and 19% of items were "no-go" stimuli.

BIS-11

The Barrat Impulsivity Scale was sourced from resources referenced in previous studies of adults who have experienced a stroke (Scheffer et al., 2016). This survey was adapted to provide the same questions using more simple vocabulary. The BIS-11 is a self-reporting survey consisting of 30 questions to measure impulsivity. The BIS-11 has three subscales to further investigate different types of impulsivity: Attention Impulse, Motor Planning, and Non-planning. Motor planning impulsiveness is acting in the spur of the moment without processing the act. Attentional impulsiveness is the inability to maintain focus on a task. Non-planning is a focus on the present with the inability to consider future consequences (Dunne et al., 2019) Each question was displayed on

Google Forms with a 4-point Likert scale to select from (e.g. rarely/never, occasionally, often, and Almost always/always).

UPPS-P

The UPPS-P short is a self-reporting survey consisting of 20 questions to measure impulsivity. Similar to the BIS-11 it has questions that can be answered given a 4-point Likert scale (e.g., agree strongly, agree some, disagree some, disagree strongly). It measures impulsivity by five facets: Positive Urgency, Negative Urgency, Lack of Premeditation, Lack of Perseverance, and Sensation Seeking. Positive Urgency is the tendency to act impulsively due to positive affect, Negative Urgency is the tendency to act impulsively due to negative affect, Premeditation measures tendency to act hastily without first reflecting upon the decision, Perseverance measures the tendency to not complete projects, Sensation Seeking measures motivation to experience something new or unusual (Cyders et al., 2014). When scoring the UPPS-P short version many of the Likert number associations need to be reversed for proper scoring in which a score of 1 would be reversed to a score of 4, or a score of 2 would be reversed to a score of three. See Appendix C for a scoring reference of the UPPS-P.

Statistical Analyses

Data collected from the Go/No-Go task analyzed the overall mean percentage for completing Go stimuli (selecting the space bar when an orange box appears on the screen) for overall performance of all participants as well as performance between groups (stroke and control). Furthermore, an analysis was done to determine the mean percentage of correct inhibited action during No-Go stimuli presentation (No selection

when a blue box was presented on the screen) for overall performance of all participants as well as performance between groups (stroke and control). Additionally, t-test measures were performed for overall performance as well as for Go and No-Go trial, respectively, to compare performance across the stroke and control groups.

BIS-11 self-reporting survey was analyzed to determine the average mean score for each question as well as within each subscale: Attention Impulse, Motor Planning and Non-planning for both the stroke and control group. Each participant's survey responses were converted into a numerical Likert scale according to the standard scoring procedure of this survey (Patton et al., 1995) in which 1 correlated to "rarely/never" or "always disagree" and a score of 4 corelated with "always" or "always agree". t-tests were performed for both the individual questions and the subscales to compare the stroke and control group performance.

The UPPS-P self-reporting survey was analyzed to determine the average mean score for each question for each group. The scores were then analyzed according to subscales of the UPPS-P: Negative Urgency, Lack of Perseverance, Lack of Premeditation, Sensation Seeking, and Positive Urgency within the stroke and control groups, respectively. t-tests were also collected for both individual questions and subscales.

CHAPTER 4

RESULTS

Go/No-Go Task

An average score for each Go response was calculated for both the stroke and control group revealing that stroke participants responded overall to the Go and No-Go stimuli with 88.59% accuracy. The control group responded correctly to the Go and No-Go stimuli with 96% accuracy. (See Figure 6). Figure 7 demonstrates the percentage accuracy for both groups for just the Go stimuli. This revealed that the stroke group responded with 86.58% accuracy, while the control group responded with 96% accuracy to these Go trials. For the No-Go stimuli, the stroke group responded correctly with 91% accuracy, and the control group responded with 94% accuracy (See Figure 8). t-test calculations comparing the stroke and control groups for overall, Go, and No-Go perfornance, respectively, did not find any significant results- this is expected due to the high variability of the stroke group in terms of severiy and areas of damage. Independent samples t-tests threshold of < 0.05 is significant (see Table 1).

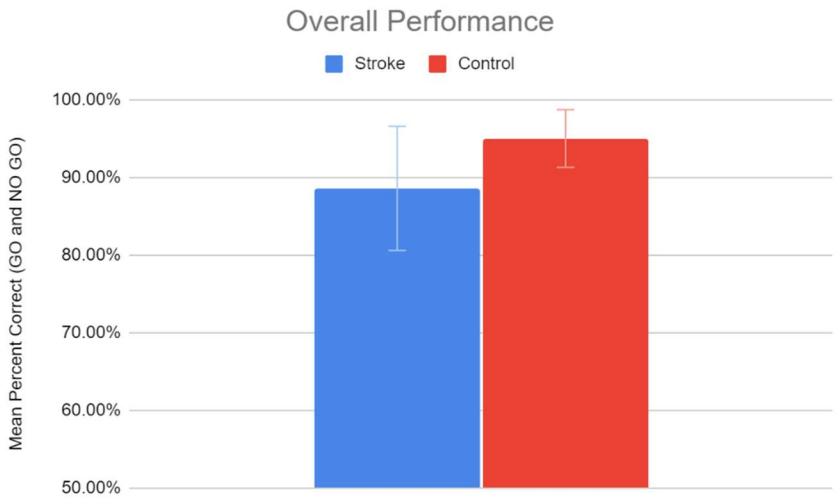

Figure 6:Mean Overall Performance of Go & No-Go Stimuli within the stroke and control groups. Error bars represent standard error.

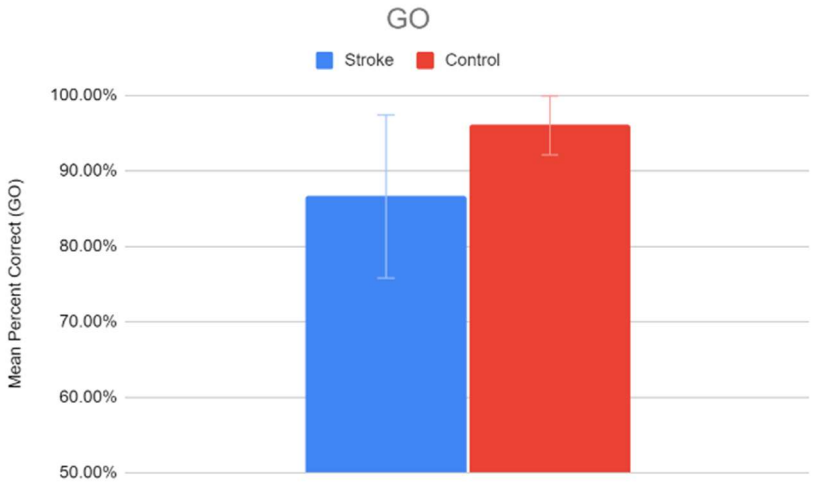

Figure 7: Mean Overall Performance of Go Stimuli within the stroke and control groups. Error bars represent standard error.

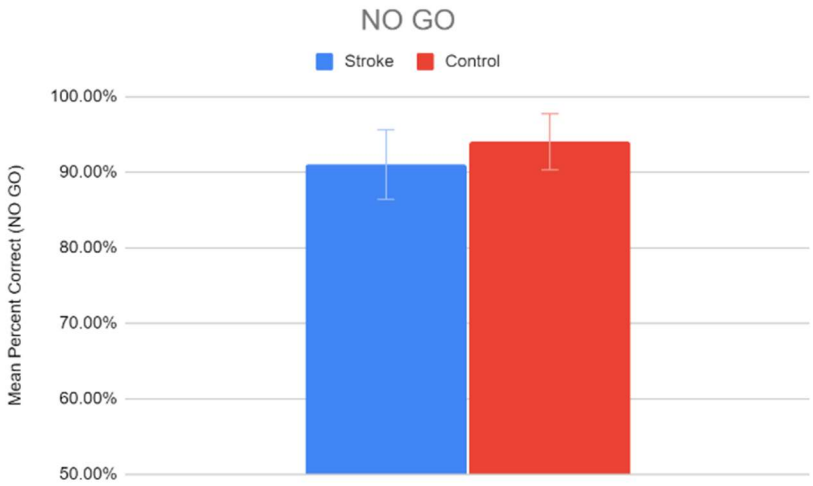

Figure 8: Mean Overall Performance of No-Go Stimuli within stroke and control groups. Error bars represent standard error.

Go/No-Go task t-test	t-test results
Stroke overall performance	t(33)=0.30, p=0.4
Control overall performance	t(33)=0.30, p=0.4
Go stimuli performance	t(33)=0.99, p=0.2
No-go stimuli performance	t(33)=0.57, p=0.3

Table 1: t-test results for overall performance of Go/No-Go task between groups (stroke and control) & p values for overall Go performance and No-Go performance.

BIS-11

To analyze the BIS-11 survey a mean score for each question was computed for each group, as well as a mean for each group for each subscale. See Figure 9 and 10 below and appendix A for a review of the results. Independent samples t-tests threshold of < 0.05 is significant, revealed that the stroke group performed significantly high on the overall BIS-11, which was driven by significant differences in attention impulse and non-planning subscales of the BIS-11 (see Table 1 below). These findings indicate that, on average, the stroke group exhibited greater impulsivity than the control group.

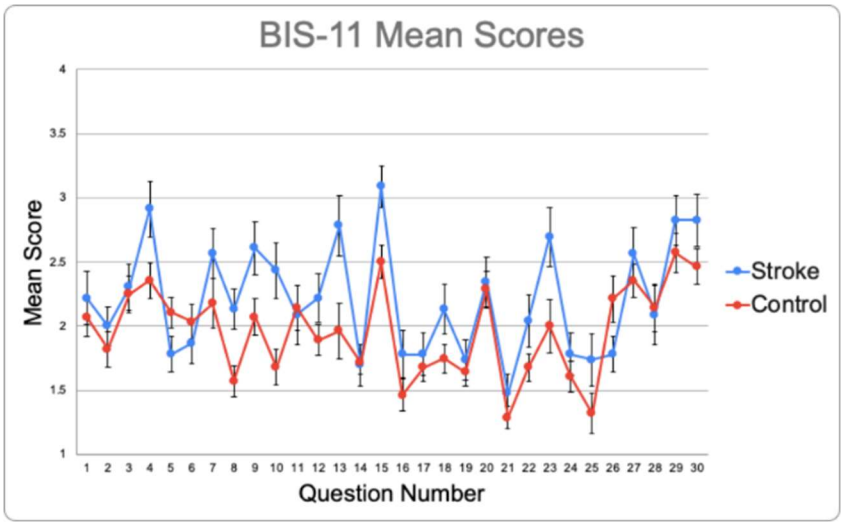

Figure 9:BIS-11 Mean Scores on each question. Error bars represent standard error.

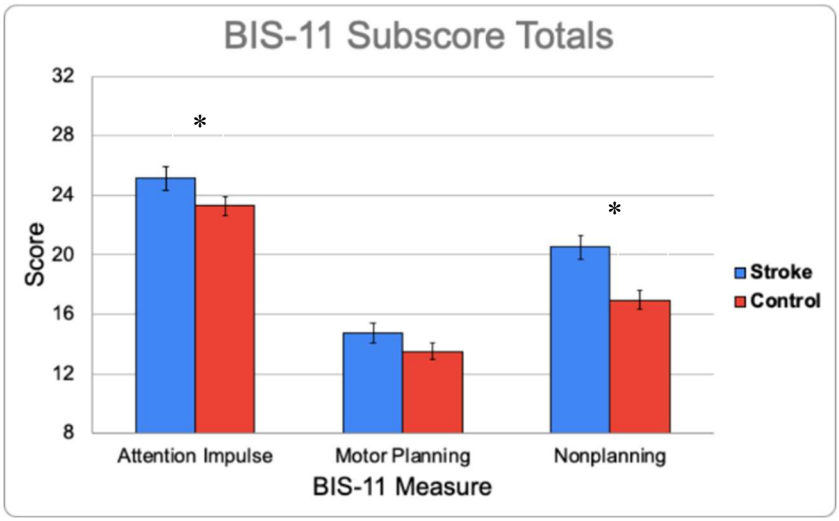

Figure 10 Mean BIS-11 Subscale Totals. Error bars represent standard error. Asterisks indicate graphs of significant differences.

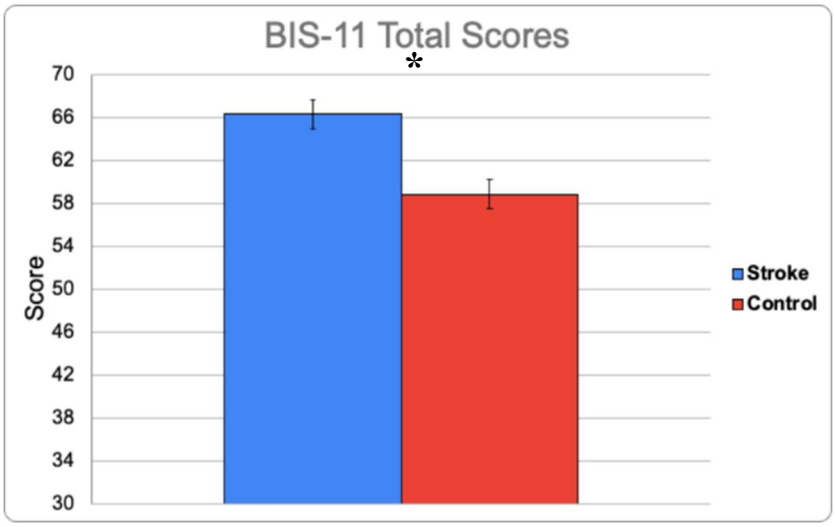

Figure 11: Mean BIS-11 Total Scores. Error bars represent standard error. Asterisks indicate graphs of significant differences.

BIS-11 Measure	t-tests results
Attention Impulse	t(50)=1.80, p=0.04
Motor Planning	t(50)=1.47, p=0.07
Non-Planning	t(50)=3.61, p= <0.001
Total	t(50)= 3.96, p=<0.001

Table 2: t-test results of stroke vs control group t-tests for BIS-11

UPPS-P short

Data collected from the UPPS-P survey was scored similarly to BIS-11. For each question, a mean score for each group (stroke or control) was computed, and mean scores for each group on each subscale were calculated (figures 12-14) The t-tests comparing the stroke versus control group for each UPPS-P subscale and total score revealed that the stroke group exhibited significantly greater impulsivity overall as measured by the total score, as well as on subscales except Sensation Seeking (see table 2 below).

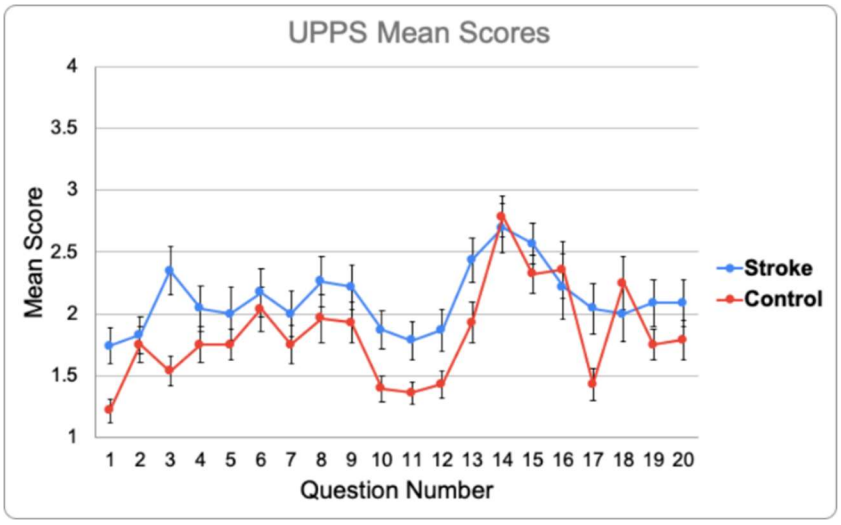

Figure 12: UPPS-P Mean Score

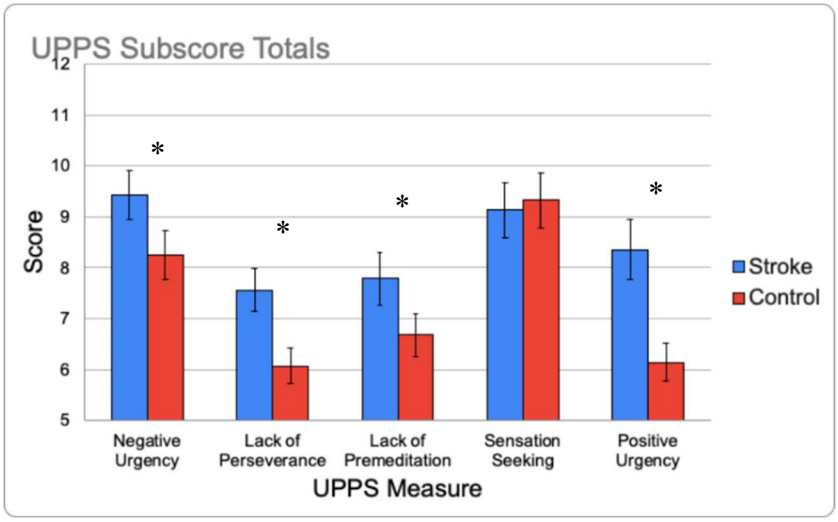

Figure 13: Mean UPPS-P Subscale Totals. Error bars represent standard error. Asterisks indicate graphs of significant differences.

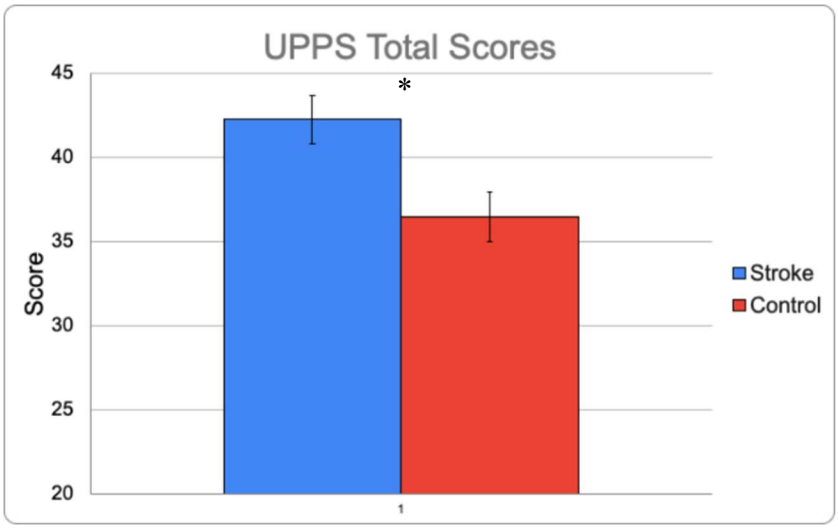

Figure 14: Mean UPPS-P Total Scores. Asterisks indicate graphs of significant differences.

UPPS-P Measure	t-test results
Negative Urgency	t(50)= 1.72, p=0.04
Lack of Perseverance	t(50)= 2.79, p=0.004
Lack of Premeditation	t(50)=1.70, p=0.05
Sensation Seeking	t(50)=0.25, p=0.40
Positive Urgency	t(50)=3.29, p= <0.001
Total	t(50)=2.82, p=.0035

Table 3: t-test results for stroke vs control group UPPS-P subtests

CHAPTER 5

DISCUSSION

The purpose of this study was to garner information about impulsiveness in adults after a stroke and compare those results to results of neurotypical peers. Our findings indicate that there is likely a presence of heightened impulsivity in adults who have experienced a stroke with an aphasia diagnosis, but there is a need for further research on this subject. This preliminary investigation is a first step towards better understanding how the effects of a stroke can impact the quality of life of those impacted.

Go/No-Go Task

It was expected that the results of the Go/No-Go task would show greater incorrect responses during the No-Go stimuli presentation. However, the results indicated that on average stroke group participants had a greater difficulty with correctly reacting to Go stimuli when it was presented to them versus the control participants. This may still indicate a deficit in impulsivity; however, other factors may have been fatigue time from completing a survey and the Go/No-Go task, memory/understanding of instructions or the ratio of Go stimuli to No-Go Stimuli. Further when examining each participant who had a stroke and their individual overall accuracy for Go and No-Go stimuli, there was a lot of variation found between subjects. This variability is worth looking into and further investigating. Previous research on individuals with Parkinson's revealed that adults with Parkinson's had similar results: a greater percentage of target misses (not responding to the Go stimuli) ($p = .0002$) and greater false alarm rates (responding when they should have inhibited the action) ($p = .02$). The Parkinson's participants showed more difficulty with pressing the button when presented with the Go stimuli as compared to inhibiting

motor function when presented with a No-Go stimulus. (RG Cohen et al., 2014). This points to an interesting similarity as our current study found that stroke participants had more inhibited responses when presented with a Go stimulus. Other studies found little errors in responses for both Go and No-Go trials when assessing Parkinson's participants (Franz & Miller, 2002). However, this study was focused on response time of individuals with Parkinson's and allowed participants to use two hands for the task which could have an impact on the variance in results.

This task is a great tool to use with adults who have experienced a stroke as it is simplified to be digestible by any user, however further research should eliminate some of the aforementioned factors such as fatigue and comprehension deficits to ensure that data collected is not affected by these factors.

BIS-11

Results of the BIS-11 subscales indicate that mean scores for the experimental group and the control group are significant revealing the stroke participants had a significant average score above the control group in the subscales of Attention Impulse and Non-planning subscales. Table 1 indicates that the higher mean scores of stroke participants as compared to the control group had a statistical significance of $< .001$ for the subscale of non-planning which indicates that this is an area of greatest impulsivity in adults who have experienced a stroke as compared to the control group. Additionally, Table 1 indicates the mean score between stroke participants and control participants for the subscale of attention impulse had a statistical significance of 0.04. Scores for motor planning inhibition were not statistically significant ($> .05$) in either the mean scores for subscale or the mean score for each question.

Previous research by Stanford et. al, 2009 reviewed a series of studies in which the BIS-11 was used. These results indicated that a score of 72 or higher was typically associated with drug abusing participants or psychiatric patients (Stanford et al., 2009) Although overall scores for our participants did not reach this level, there is still some obvious indication of heightened impulsivity as compared to neurotypical peers. Additionally, previous research involving adults with right hemisphere strokes as average scores for stroke participants with frontal lesions were 58, extra-frontal lesions average scores were 60, and the control groups average score was 56. Our study indicates that stroke participants scored on average 66 and controls scored on average 58.

When comparing the stroke group versus the control group scores for individual questions from Figure 9 questions 4, 10, 13, 23 were noteworthy. These four questions had stroke participants mean score of 1 point or greater above the control group mean score. The aforementioned questions fit into two of the three subscales. Questions 4, 10, and 13 all fall under the non-planning subscale, while question 23 falls under the attention impulse subscale. This provides a better lens of what areas of impulsivity may be heightened after a stroke. This survey has proven to be a strong resource for identifying impulsive characteristics among many different populations and groups (Stanford et al., 2009). However, this survey has not been used as frequently with adults who have experienced a stroke. For future research if this study were to be used again, it should be noted that the questions on the BIS-11 should be modified to allow for more simplified easier to comprehend language, especially as many adults who have experienced a stroke also have a language disorder known as aphasia.

UPPS-P

The UPPS-P data points were analyzed to produce a mean score for each subscale according to experimental and control group. The results from the subscales indicate that participants who have experienced a stroke showed significantly greater impulsiveness in the areas of Negative Urgency (p value = .04), Lack of Perseverance (p value = .004), Lack of Premeditation (p value = .05), and Positive Urgency (p value <.01). There was no significant difference between groups in the subscale of Sensation Seeking. Positive Urgency is the tendency to act impulsively due to positive affect, Negative Urgency is the tendency to act impulsively due to negative affect, Premeditation measures tendency to act hastily without first reflecting upon the decision, Perseverance measures the tendency to not complete projects.

Previous research of UPPS-P short form with Parkinson's participants compared to control found that Parkinson's participants showed greater impulsivity in the areas of Urgency, Lack of premeditation and Lack of perseverance. Additionally, the subscale of sensation seeking was found to have no statistical significance for this population. This information indicates that there may be similar presentations of impulsivity in adults who have experienced a stroke and adults who have a diagnosis of Parkinson's disease (Bayard et al., 2016).

Adults who have experienced a stroke may be more likely to act impulsively when their emotions are heightened either positively or negatively. Additionally, they may have a tendency to move on from something before completing a prior task, and present with deficits in preplanning before acting. Comparing these results to the BIS-11 it should be noted that in both surveys results indicate greater impulsivity regarding planning or processing through a decision before acting. When examining the individual

questions with the greatest mean score difference between the experimental group and the control group the following questions were identified: 1,3, 10, 12, 13, 17. Question 1 aims at determining impulsiveness regarding lack of perseveration. Question 12 assesses impulsiveness regarding lack of premeditation. Additionally, question 3, 10, and 17 all assessed impulsiveness of positive urgency. These questions may indicate that adults who have experienced a stroke may act more impulsively when experiencing heightened positive emotions. This may be of concern for a person with a stroke who has lesions that affect or reach frontal portions of their brain as we know the frontal lobe has significant involvement in our emotions and judgement. The UPPS-P is also a survey that has been used to assess impulsivity across a wide range of populations, however there is no literature that we know of that has used this survey for evaluating stroke participants. While combining the BIS-11 and the UPPS-P into one comprehensive survey was beneficial for ease of access to participants it may have caused fatigue, or promoted lack of interest from participants, as the two surveys combined generated a lengthy questionnaire. This question of fatigue/progressive loss of interest may have impacted the number of results received from the Go/No-Go task which was lower than results received from the survey. Future studies should investigate whether a more condensed questionnaire can be developed.

CHAPTER 6

CONCLUSION

Impulse control disorders can greatly impact the quality of life of the individual with the diagnosis as well as their community. But previously little research has been done to evaluate the presence of ICDs among adults who have experienced a stroke. The present study serves as a starting point to discovering more about how various facets of impulsivity may impact the lives of adults after experiencing a stroke. This study indicates that adults with a history of a stroke present with higher impulsivity measures especially in areas acting before planning and acting due to an increase in mood. One potential area to further investigate may be the impact of higher impulsivity measures on the quality of life for individuals with a history of stroke. This could provide greater knowledge of more underlying deficits that could be targeted in the acute stages of recovery.

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APPENDIX A

BIS-11 SURVEY

APPENDIX A

BIS-11 SURVEY

DIRECTIONS: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and put an X on the appropriate circle on the right side of this page. Do not spend too much time on any statement. Answer quickly and honestly.

	① Rarely/Never	② Occasionally	③ Often	④ Almost Always/Always
1	I plan tasks carefully.			① ② ③ ④
2	I do things without thinking.			① ② ③ ④
3	I make-up my mind quickly.			① ② ③ ④
4	I am happy-go-lucky.			① ② ③ ④
5	I don't "pay attention."			① ② ③ ④
6	I have "racing" thoughts.			① ② ③ ④
7	I plan trips well ahead of time.			① ② ③ ④
8	I am self controlled.			① ② ③ ④
9	I concentrate easily.			① ② ③ ④
10	I save regularly.			① ② ③ ④
11	I "squirm" at plays or lectures.			① ② ③ ④
12	I am a careful thinker.			① ② ③ ④
13	I plan for job security.			① ② ③ ④
14	I say things without thinking.			① ② ③ ④
15	I like to think about complex problems.			① ② ③ ④
16	I change jobs.			① ② ③ ④
17	I act "on impulse."			① ② ③ ④
18	I get easily bored when solving thought problems.			① ② ③ ④
19	I act on the spur of the moment.			① ② ③ ④
20	I am a steady thinker.			① ② ③ ④
21	I change residences.			① ② ③ ④
22	I buy things on impulse.			① ② ③ ④
23	I can only think about one thing at a time.			① ② ③ ④
24	I change hobbies.			① ② ③ ④
25	I spend or charge more than I earn.			① ② ③ ④
26	I often have extraneous thoughts when thinking.			① ② ③ ④
27	I am more interested in the present than the future.			① ② ③ ④
28	I am restless at the theater or lectures.			① ② ③ ④
29	I like puzzles.			① ② ③ ④
30	I am future oriented.			① ② ③ ④

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APPENDIX B

UPPS-P SURVEY

APPENDIX B

UPPS-P SURVEY

SHORT UPPS-P (Cyders et al., *Addictive Behaviors*, 2014)

Short UPPS-P

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you **Agree Strongly** circle **1**, if you **Agree Somewhat** circle **2**, if you **Disagree somewhat** circle **3**, and if you **Disagree Strongly** circle **4**. Be sure to indicate your agreement or disagreement for every statement below.

	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
1. I generally like to see things through to the end.	1	2	3	4
2. My thinking is usually careful and purposeful.	1	2	3	4
3. When I am in great mood, I tend to get into situations that could cause me problems.	1	2	3	4
4. Unfinished tasks really bother me.	1	2	3	4
5. I like to stop and think things over before I do them.	1	2	3	4
6. When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
7. Once I get going on something I hate to stop.	1	2	3	4
8. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
9. I quite enjoy taking risks.	1	2	3	4
10. I tend to lose control when I am in a great mood.	1	2	3	4
11. I finish what I start.	1	2	3	4
12. I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
13. When I am upset I often act without thinking.	1	2	3	4
14. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
15. When I feel rejected, I will often say things that I later regret.	1	2	3	4
16. I would like to learn to fly an airplane.	1	2	3	4
17. Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4
18. I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
19. I usually think carefully before doing anything.	1	2	3	4
20. I tend to act without thinking when I am really excited.	1	2	3	4

APPENDIX C

UPPS-P SCORING INFORMATION

APPENDIX C

UPPS-P SCORING INFORMATION

SHORT UPPS-P (Cyders et al., *Addictive Behaviors*, 2014)

Table 1. *Final Items Included in the SUPPS-P (Lynam, 2013)*

Negative Urgency (M = 1.35, SD = 0.70; Range: 0.00 – 3.00; α = 0.78)	
6. (17.)	When I feel bad, I will often do things I later regret in order to make myself feel better now. **(R)**
8. (22.)	Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse. **(R)**
13. (29.)	When I am upset I often act without thinking.* **(R)**
15. (34.)	When I feel rejected, I will often say things that I later regret.* **(R)**
Lack of Perseverance (M = 0.64, SD = 0.54; Range: 0.00 – 2.67; α = 0.79)	
1. (4.)	I generally like to see things through to the end.*
4. (14.)	Unfinished tasks really bother me.
7. (19.)	Once I get going on something I hate to stop.
11. (27.)	I finish what I start.
Lack of Premeditation (M = 0.80, SD = 0.56; Range: 0.00 – 2.50; α = 0.85)	
2. (6.)	My thinking is usually careful and purposeful.*
5. (16.)	I like to stop and think things over before I do them.
12. (28.)	I tend to value and follow a rational, "sensible" approach to things.
19. (48.)	I usually think carefully before doing anything.*
Sensation Seeking (M = 1.78, SD = 0.73; Range: 0.00 – 3.00; α = 0.74)	
9. (23.)	I quite enjoy taking risks.* **(R)**
14. (31.)	I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.* **(R)**
16. (36.)	I would like to learn to fly an airplane. **(R)**
18. (46.)	I would enjoy the sensation of skiing very fast down a high mountain slope. **(R)**
Positive Urgency (M = 0.90, SD = 0.74; Range: 0.00 – 3.00; α = 0.85)	
3. (10.)	When I am in great mood, I tend to get into situations that could cause me problems. **(R)**
10. (20.)	I tend to lose control when I am in a great mood. **(R)**
17. (35.)	Others are shocked or worried about the things I do when I am feeling very excited. **(R)**
20. (52.)	I tend to act without thinking when I am really excited.* **(R)**

Note. Item numbers indicate the item order on the Short UPPS-P, whereas numbers in parentheses indicate the original item numbers on the UPPS-P. All items are rated on a four point scale from 1 (strongly agree) to 4 (strongly disagree). Items with an (R) are reverse coded, so that higher values indicate more impulsive behavior. Total subscale or Mean subscale scores can be calculated. * indicates that the item is also present in the French Short UPPS-P Scale. † indicates that the item is also present in the Spanish Short UPPS-P Scale.

(R) indicates the item needs to be reverse scored such 1=4, 2=3, 3=2, and 4=1