

## 4.0 Cognitive Function

Tables summarizing scores on measures of cognitive function at baseline and assessed two months after two experimental (MDMA or placebo) sessions are presented below in Tables 10-15 and in Appendices 7-9. The data consist of scores from all 21 participants who completed the study. Because the two participants who withdrew from the study each underwent one experimental session and neither completed tests two months after this session, their baseline scores will not be presented.

### 4.1 PASAT

The Paced Auditory Serial Addition and Subtraction Test (PASAT) involves performing arithmetic problems presented via audio tape. Individual baseline and follow-up scores are presented in the Appendices 6-8 and Means are summarized below. No differences between placebo and MDMA participants in baseline PASAT were seen through an independent sample t-test, a second independent sample t-test continued to find no statistically significant differences in PASAT performance, whether assessed as raw score or as percentage correct. (Trial 1 raw scores, variance not equal,  $t(df = 10.5) = 1.73$ ,  $p > 0.05$ , Trial 1 percentage,  $t(df = 19) = 1.53$ ,  $p > 0.05$ , Trial 2 raw score  $t(df = 18) = -0.42$ ,  $p > 0.05$ , Trial 2 percentage score  $t(df = 18) = 0.15$ ,  $p > 0.05$ . Participants in the MDMA did not exhibit impaired performance on this paced arithmetic task when compared with placebo.

**Table 10: PASAT Baseline Scores Equations for Trial 1 at 3-second intervals and Trial 2 at two-second Intervals**

		Trial 1 Raw		Trial 2 Raw	
		Score	Percent Score	Score	Percent Score
Placebo N=8*	Mean (Standard Deviation)	40.4 (13.6)	34.7 (34.9)	32.6 (11.3)	34.3 (32.9)
MDMA N=13	Mean (Standard Deviation)	47.1 (7.7)	44.8 (29.0)	34.1 (7.3)	37.2 (25.2)

\*N=7 for Trial 1 Percent Score

**Table 11: PASAT scores at 2 Month Follow-Up Equations for Trial 1 at 3-second intervals and Trial 2 at two-second Intervals**

		Trial 1 Raw		Trial 1 Raw	
		Score	Percent Score	Score	Percent Score
Placebo N=8*	Mean (Standard Deviation)	42.6 (12.3)	38.2 (36.02)	38.0 (12.4)	46.3 (34.1)
MDMA N=13	Mean (Standard Deviation)	51.0 (7.6)	59.5 (27.6)	36.2 (7.01)	44.3 (24.9)

## 4.2 RBANS

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) is a relatively short series of tests used to examine cognitive function. It yields a total score and five sub-scales, including memory, visual spatial, language, attention and delayed memory. The measure produces index and centile scores, but both represent the same data with different metrics. Means of the Index scores are presented in Table 12. Individual case listings of total and all subscale scores are presented in Appendix 8. An independent sample t-test failed to find statistically significant differences in total or sub-scale index scores between participants in the two conditions at baseline,  $T(df = 19) = -1.75, p > 0.05$ . A second independent samples t-test conducted on total scores two months after the second experimental session also failed to find significant differences between people in the MDMA and placebo condition,  $t(df = 19) = 0.82, p > 0.05$ . An independent sample t-test of RBANS total and sub-scale index scores at two-month follow-up also failed to find significant differences after two experimental sessions. Likewise, a comparison of baseline subscale scores failed to find any differences between people assigned to the MDMA and placebo condition, and a second independent sample t-test also failed to find significant differences between MDMA and placebo participants on any subscale score; memory,  $t(df = 8.9) = 4.26, p > 0.05$ , visual spatial memory  $t(df = 19) = 0.006$ , language  $t(df = 19) = -1.03$ , attention  $t(df = 19) = -0.48$ , delayed memory  $t(df = 19) = -0.23$ , all  $p > 0.05$ . Two months after two experimental sessions, participants in the MDMA condition did not exhibit significantly lower scores than participants in the placebo condition.

**Table 12: RBANS Sub-Scale and Total Scores at Baseline and Two-Month Follow-Up in MDMA and Placebo Participants**

		Memory	Visual Spatial	Language	Attention	Delayed Memory	Total Score
<b>Placebo N=8</b>							
Baseline	Mean	104.4	100.6	101.1	93.6	92.6	97.5
	Std.Deviation	19.4	16.1	8.6	12.7	9.9	12.7
2-Month Follow-Up	Mean	110.3	108.9	96.6	101.5	101.8	104.9
	Std.Deviation	18.1	10.0	8.6	10.0	14.1	12.1
<b>MDMA N=13</b>							
Baseline	Mean	108.1	102.1	109.9	104.3	103.8	107.8
	Std.Deviation	9.4	6.5	14.4	15.4	11.1	13.5
2-Month Follow-Up	Mean	114.6	108.8	101.4	105.0	102.8	109.0
	Std.Deviation	8.6	10.8	11.1	19.2	8.1	10.8
<b>Total N=21</b>							
Baseline	Mean	106.7	101.5	106.6	100.2	99.6	103.9
	Std.Deviation	13.7	16.0	13.0	15.1	11.8	13.8
2-Month Follow-Up	Mean	113.0	108.9	99.6	103.7	102.4	107.4
	Std.Deviation	12.9	10.3	10.3	16.1	10.5	11.2

### 4.3 Rey-Osterrieth Complex Figure Test

The Rey-Osterrieth Complex Figure Test involves viewing and copying a figure from the original, and after a three-second and thirty-second delay. Although a number of scores are computed from the test, the score at 30-second delay, a measure of visual memory, was most relevant for assessing potential memory impairment. Individual case summaries of this score are presented in Appendix 9 and the Means are presented below.

Two participants did not complete assessments at the second timepoint because they dropped out of the study. The 30-second delay T score is expressed as being “<20” for one participant at baseline assessment, and the data for this score will thus not be included in mean calculations or analyses. Finally, one participant failed to complete the Rey-Osterrieth Figure two months after the second experimental session. A comparison of baseline Rey-CFT thirty-second delay scores failed to find a difference between MDMA and placebo participants,  $t(df = 18) = -1.3, p > 0.05$ ,  $t(df = 18) = -1.22, p. > 0.05$ . A second independent samples t-test conducted on scores two months after a second experimental session also failed to find a difference between MDMA and placebo participants,  $t(df = 19) = -0.12, p > 0.05$ ,  $t(df = 19) = 0.35, p. > 0.05$ . Two months after two sessions of MDMA-assisted psychotherapy, participants in the MDMA condition did not exhibit lower delayed visual memory, as measured in the Rey-Osterrieth 30-second delay scores, than participants in the placebo condition.

**Table 13: 30-Second Delay Score for Rey-Osterrieth Figure, a Measure of Memory**

	30-Second Delay Raw Score		30-second Delay T Score	
	Baseline	2 Months Post Experimental Session 2	Baseline	2 Months Post Experimental Session 2
Placebo N=	8	8	8	8
Mean (Std.Deviation)	18.6 (2.8)	16.9 (4.4)	42.9 (6.2)	39.5 (9.1)
Min-max	14.00-22.0	9.5-23.0	33.0-51.0	24.0-51.0
MDMA N=	12	13	12	13
Mean (Std. Deviation)	21.2 (5.2)	17.2 (6.8)	48.2 (11.0)	37.2 (17.0)
Min-Max	14.0-30.0	3.0-27.5	30.0-68.0	.0-60.0

These assessments did not detect any indications of impaired cognitive function after exposure to MDMA in two experimental sessions.

Tables 2-13 indicates the range of physiological and psychological effects of MDMA and demonstrates that at no point was a medical intervention required. Assessment of cognitive function two months after experimental sessions failed to find any impairment in cognitive function. Taken together, this data supports the safety of this dose regimen of MDMA given in this study.