Supplemental Results

First we report in Supplemental Table 1 the descriptive statistics and effect sizes for repetitions and intrusions, as well as hits and false alarm errors for the samples reported in main text.

[INSERT SUPPLEMENTAL TABLE 1 ABOUT HERE]

For the remainder of these Supplemental Results, we re-examined all of the analyses reported in the main text with fully-matched groups, in which control and sub-acute groups were individually matched 1:1 for age and gender and the chronic group included only mTBI. These Supplemental Results were overall similar to those reported in the main text. Descriptive statistics for the variables of main interest are reported in Supplemental Table 2. These values are similar to those reported in the main text (see again Table 2). Sub-acute and chronic mTBI again showed delayed memory deficits, recalling on Trial 4 approximately 19% and 14% fewer words than controls, respectively.

[INSERT SUPPLEMENTAL TABLE 2 ABOUT HERE]

Supplemental Table 3 reports effect sizes and 95% CIs that were qualitatively similar to results reported in the main text. For the *sub-acute minus control* contrast, effect sizes for total-correct on Trial 4 were relatively large, g = -1.22, 95% CI = (-1.96, -.49). For the *chronic minus control* contrast, effect sizes for total-correct on Trial 4 were likewise relatively large, g = -.85, 95% CI = (-1.58, -.13). Results suggest again, as in the main text, that both patient groups had delayed memory deficits relative to controls.

[INSERT SUPPLEMENTAL TABLE 3 ABOUT HERE]

Supplemental Table 4 shows that correlations among variables were much the same as reported in the main text. As in the main text, total-correct on Trial 4 was most strongly correlated positively with semantic clustering on Trial 4 and the executive composite (r= .51 and r = .50, respectively). It was again less strongly positively correlated with the executive function domains of cognitive control, working memory, and fluency (r = .45, r = .35, and r = .34, respectively), and education (r = .32). It was again more weakly, negatively correlated with age (r = -.27) and again very nearly unrelated to serial clustering (r = .08). Again, education was positively correlated with semantic clustering on Trial 4 and the executive function composite (r = .45 and r = .35, respectively), which were likewise positively correlated with each other (.17). Overall, these parameter estimates were quite close to those in the main text. Scatterplots are in Figure S1, depicting relationships among delayed memory performance, education, semantic clustering, and the executive composite, separately for the three fully-matched groups.

[INSERT SUPPLEMENTAL TABLE 4 ABOUT HERE]

[INSERT FIGURE S1 ABOUT HERE]

As in the main text we used a multiple regression model to assess the degrees to which variance in delayed memory performance (total-correct on Trial 4) was related to variance between groups, or inter-individual variance in education, semantic clustering on Trial 4, serial clustering on Trial 4, or the executive function composite. These predictors were entered simultaneously, thus controlling for variance shared amongst them. As in the main text analysis, the group factor was represented by two dummy-coded variables entered together, individually representing the contrasts between sub-acute versus control, and between chronic versus control. Unstandardized B-weights and 95% CIs are reported in Supplemental Table 5. Regression results showed that, as in the main text results, about half the variance in delayed memory

performance was accounted for by the model, Total $R^2 = .51$, $R^2_{adj} = .44$. Parameter estimates were quite close to those reported in the main text, with results showing again that delayed memory performance was strongly related to semantic clustering and general executive function.

[INSERT SUPPLEMENTAL TABLE 5 ABOUT HERE]

Finally, Supplemental Table 6 shows descriptive statistics and effect sizes for repetitions and intrusions (summed across trials), as well as hits and false alarm errors in the recognition test, for the fully-matched groups. As in the main text results, these results show that sub-acute patients committed more repetitions than chronic patients did, and chronic patients had fewer hits in the recognition portion of the test than controls did. Also as in the main text results, repetitions and intrusions were weakly, negatively correlated with total-correct on Trial 4 ($r = -.09$ and $r = -.14$, respectively). And again as in main text results, hits were strongly, positively correlated with total-correct on Trial 4 ($r = .60$), while false alarm errors were negatively, moderately correlated with total-correct on Trial 4 ($r = -.42$).

[INSERT SUPPLEMENTAL TABLE 6 ABOUT HERE]

Supplemental results summary

We re-examined all of the analyses reported in the main text, with fully-matched groups in which control and sub-acute groups were individually matched 1:1 for age and gender, and in which the chronic group excluded individuals with moderate TBI. Supplemental Results were overall similar to those reported in the main text. Sub-acute as well as chronic mTBI patients showed delayed memory deficits, recalling on Trial 4 approximately 19% and 14% fewer words than controls, respectively. Both semantic clustering and the executive function composite were strongly related to delayed memory performance.

Supplemental Table 1

	Control	**Sub-acute**	**Chronic**
	M (SD)	*M (SD)*	*M (SD)*
Repetitions (T1-T4)	2.29 (3.24)	2.22 (2.08)	1.10 (1.22)
Intrusions (T1-T4)	.62 (1.12)	.97 (1.44)	.52 (1.03)
Hits	11.76 (.44)	11.46 (.80)	11.00 (1.07)
False Alarms	.52 (.68)	.84 (1.09)	.76 (.97)
	Sub-acute minus control	**Chronic minus control**	**Sub-acute minus chronic**
	ES (CI)	*ES (CI)*	*ES (CI)*
Repetitions (T1-T4)	-.03 (-.56, .51)	-.48 (-1.09, .14)	.61 (.06, 1.15)
Intrusions (T1-T4)	.26 (-.28, .80)	-.09 (-.70, .51)	.34 (-.20, .88)
Hits	-.43 (-.97, .11)	-.91 (-1.55, -.28)	.50 (-.04, 1.04)
False Alarms	.33 (-.21, .87)	.28 (-.33, .89)	.08 (-.46, .61)

Note. Descriptive statistics and effect sizes for selected variables of additional interest (main text). (N = 79; control n = 21, sub-acute n = 37, chronic n = 21). T1 - T4 refers to the sum across Trials 1 through 4. The standardized effect size (ES) was calculated as the difference between means divided by the pooled estimate of standard deviation, and was corrected for bias using the method in Hedges & Olkin (1985; Hedges' g).

Supplemental Table 2

	Control	**Sub-acute**	**Chronic**
	_M (SD)_	_M (SD)_	_M (SD)_
Age	31.18 (12.33)	31.12 (11.77)	35.80 (10.47)
Education	16.12 (2.09)	13.88 (2.40)	15.07 (2.63)
Executive	1.08 (.53)	.70 (.54)	.84 (.58)
Cog-ctl	1.08 (.49)	.88 (.67)	.64 (.72)
WM	.72 (.68)	.39 (.47)	.66 (.52)
Fluency	.97 (.61)	.45 (.64)	.82 (.66)
Sem clust T1	.51 (1.87)	.54 (1.25)	.51 (1.64)
Sem clust T2	1.80 (2.34)	.65 (1.57)	1.70 (2.21)
Sem clust T3	1.80 (2.27)	1.72 (1.62)	2.47 (2.09)
Sem clust T4	3.43(2.71)	1.41 (1.90)	1.90 (1.61)
Ser clust T1	.45 (1.35)	.37 (.67)	.41 (1.15)
Ser clust T2	.57 (1.01)	.35 (.94)	.38 (1.27)
Ser clust T3	.58 (1.51)	.58 (1.32)	.43 (1.37)
Ser clust T4	.43 (1.92)	-.14 (.77)	.27 (.76)
Tot-cor T1	6.88 (1.80)	5.71 (1.31)	6.47 (2.07)
Tot-cor T2	9.71 (2.14)	8.12 (1.69)	9.20 (1.94)
Tot-cor T3	11.00 (.79)	9.50 (1.62)	10.27 (1.44)
Tot-cor T4	10.65 (1.54)	8.35 (2.09)	8.93 (2.37)

Note. Descriptive statistics for fully matched groups in Supplemental Results. Unlike main text data-set, control and sub-acute groups were matched 1:1 for age and gender, and chronic group excluded moderate TBI (total N = 49; control n = 17, 10 female; sub-acute n = 17, 10 female; chronic N = 15, 6 female). Age matched $\pm$ 2 years. Abbreviations: Cog-ctl = Cognitive control. WM = Working memory. Sem clust. = Semantic clustering. Ser clust = Serial clustering. Tot-cor = total-correct. T1 - T4 refers to Trials 1 – 4.

Supplemental Table 3 (Continues on next page)

	Sub-acute minus control	Chronic minus control	Sub-acute minus chronic
	ES (CI)	*ES (CI)*	*ES (CI)*
Age	.00 (-.68, .67)	.39 (-.31, 1.09)	-.41 (-1.11, .29)
Education	-.97 (-1.68, -.26)	-.43 (-1.14, .27)	-.46 (-1.17, .24)
Executive	-.69 (-1.39, .00)	-.42 (-1.12, .28)	-.24 (-.94, .45)
Cog-ctl	-.33 (-1.01, .34)	-.71 (-1.42, .01)	.34 (-.36, 1.04)
WM	-.55 (-1.24, .13)	-.10 (-.79, .60)	-.53 (-1.24, .17)
Fluency	-.81 (-1.51, -.11)	-.23 (-.93, .47)	-.56 (-1.26, .15)
Sem clust T1	.02 (-.65, .69)	.00 (-.69, .69)	.02 (-.67, .71)
Sem clust T2	-.56 (-1.25, .12)	-.04 (-.74, .65)	-.54 (-1.25, .17)
Sem clust T3	-.04 (-.71, .63)	.30 (-.40, 1.00)	-.39 (-1.10, .31)
Sem clust T4	-.84 (-1.54, -.14)	-.66 (-1.37, .05)	-.27 (-.97, .43)
Ser clust T1	-.07 (-.75, .60)	-.03 (-.73, .66)	-.04 (-.74, .65)
Ser clust T2	-.22 (-.89, .45)	-.16 (-.86, .53)	-.03 (-.72, .67)
Ser clust T3	0 (-.67, .67)	-.10 (-.80, .59)	.11 (-.59, .80)
Ser clust T4	-.38 (-1.06, .30)	-.10 (-.80, .59)	-.52 (-1.23, .18)
Tot-cor T1	-.73 (-1.42, -.03)	-.21 (-.90, .49)	-.43 (-1.14, .27)
Tot-cor T2	-.81 (-1.50, -.11)	-.24 (-.94, .45)	-.58 (-1.29, .13)
Tot-cor T3	-1.15 (-1.87, -.42)	-.62 (-1.33, .09)	-.49 (-1.19, .22)
Tot-cor T4	-1.22 (-1.96, -.49)	-.85 (-1.58, -.13)	-.25 (-.95, .44)

Note. Effect sizes for fully matched groups in Supplemental Results. Unlike main text data-set, control and sub-acute groups were matched 1:1 for age and gender, and chronic group excluded moderate TBI (total N = 49; control n = 17, 10 female; sub-acute n = 17, 10 female; chronic N = 15, 6 female). Age matched $\pm$ 2 years. The standardized effect size (ES) was calculated as the difference between means divided by the pooled estimate of standard deviation, and was corrected for bias using the method in Hedges & Olkin (1985; Hedges' g). Abbreviations: Cog-

ctl = Cognitive control. WM = Working memory. Sem clust. = Semantic clustering. Ser clust = Serial clustering. Tot-cor = total-correct. T1 - T4 refers to Trials 1 – 4.

Supplemental Table 4

		1.	2.	3.	4.	5.	6.	7.	8.	9.
1.	Age	-								
2.	Education	.14	-							
3.	Executive	-.14	.35	-						
4.	Cog-ctl	-.41	.00	.66	-					
5.	WM	-.33	.20	.70	.40	-				
6.	Fluency	.12	.39	.83	.23	.51	-			
7.	Sem clust T4	.03	.45	.17	.04	.22	.16	-		
8.	Ser clust T4	-.12	-.15	.14	.18	.12	.06	-.46	-	
9.	Tot-cor T4	-.27	.32	.50	.45	.35	.34	.51	.08	-

Note. Correlations among selected variables for fully matched groups in Supplemental Results. Unlike main text data-set, control and sub-acute groups were matched 1:1 for age and gender, and chronic group excluded moderate TBI (total N = 49; control n = 17, 10 female; sub-acute n = 17, 10 female; chronic N = 15, 6 female). Age matched $\pm$ 2 years. Coefficient is Pearson's r. (N = 79; control n = 21, sub-acute n = 37, chronic n = 21). Abbreviations: Cog-ctl = Cognitive-control. WM = Working memory. Sem clust. = Semantic clustering. Ser clust = Serial clustering. Tot-cor = total-correct. T4 refers to Trial 4, the delayed memory trial in HVLT-R.

Supplemental Table 5

	B *(unstandardized)*	*95% CI for B (Lower)*	*95% CI for B (Upper)*
Education	-.05	-.28	.19
Sem clust T4	.53	.24	.82
Ser clust T4	.44	-.03	.92
Executive	1.39	.44	2.34
DC1 (sub-acute vs control)	-.55	-1.97	.87
DC2 (chronic vs control)	-.56	-1.84	.73

Note. Multiple regression model predicting the dependent variable Total-Correct on Trial 4, the delayed memory trial in HVLT-R, for fully matched groups in Supplemental Results (total N = 49; control n = 17, 10 female; sub-acute n = 17, 10 female; chronic N = 15, 6 female). Unlike the main text data-set, control and sub-acute groups were matched 1:1 for age and gender, and chronic group excluded moderate TBI. Predictors were entered simultaneously: Education, Semantic clustering (Trial 4), Serial clustering (Trial 4), Executive function composite, as well as a dummy coded contrast representing sub-acute versus control (DC1) and a dummy coded contrast representing chronic versus control (DC2). Abbreviations: Sem clust = Semantic clustering. Ser clust = Serial clustering. T4 = Trial 4. Total R^2 = .51, R^2_{adj} = .44.

Supplemental Table 6

	Control	Sub-acute	Chronic
	_M (SD)_	_M (SD)_	_M (SD)_
Repetitions (T1-T4)	2.35 (3.50)	2.59 (2.40)	.73 (1.03)
Intrusions (T1-T4)	.35 (.79)	1.24 (1.56)	.53 (1.13)
Hits	11.76 (.44)	11.41 (.94)	11.13 (1.41)
False Alarms	.41 (.62)	.82 (1.24)	.67 (.72)
	Sub-acute minus control	**Chronic minus control**	**Sub-acute minus chronic**
	_ES (CI)_	_ES (CI)_	_ES (CI)_
Repetitions (T1-T4)	.08 (-.59, .75)	-.60 (-1.31, .11)	.96 (.23, 1.69)
Intrusions (T1-T4)	.70 (.01, 1.40)	.18 (-.51, .88)	.50 (-.20, 1.21)
Hits	-.47 (-1.15, .22)	-.60 (-1.31, .11)	.23 (-.47, .93)
False Alarms	.43 (-.25, 1.11)	.38 (-.32, 1.08)	.16 (-.53, .86)

Note. Descriptive statistics and effect sizes for selected variables of additional interest, for fully matched groups in Supplemental Results. Control and sub-acute groups matched 1:1 for age and gender, and chronic group excluded moderate TBI (total N = 49; control n = 17, 10 female; sub-acute n = 17, 10 female; chronic N = 15, 6 female). T1 - T4 refers to the sum across Trials 1 through 4. The standardized effect size (ES) was calculated as the difference between means divided by the pooled estimate of standard deviation, and was corrected for bias using the method in Hedges & Olkin (1985; Hedges' g).

Supplemental Figure Captions.

Figure S1. For fully-matched groups in Supplemental Results, scatterplots for key relationships among variables in the study (Total correct on Trial 4, the delayed memory trial, predicted by education, executive function, and semantic clustering (upper row), and inter-relationships among these predictors (lower row). Unlike the main text data-set, control and sub-acute groups were matched 1:1 for age and gender, and chronic group excluded moderate TBI (total N = 49; control n = 17, 10 female; sub-acute n = 17, 10 female; chronic N = 15, 6 female). Age matched $\pm$ 2 years. Individuals in control, sub-acute TBI, and chronic TBI groups are represented separately (see legend).

Figure S1