Supplementary Table 1

Supplementary Table 1. Summary of non-statistically significant differences in cognitive, neurogenic and neuroplastic analysis across experimental diets.

Test	Variable	Statistical Test	F Value	P Value
Body weight gain	Diet	Repeated measures ANOVA	F(2, 45) = 0.198	p = 0.821
	Day	Repeated measures ANOVA	F(7, 315) = 14.530	p < 0.001
	Diet x Day	Repeated measures ANOVA	F(14, 315) = 2.439	p = 0.003
Elevated plus maze	Total locomotion	One-Way ANOVA	F(2, 45) = 0.700	p = 0.502
	Time in open arms	One-Way ANOVA	F(2,45) = 0.857	p = 0.431
	Latency to open arms	One-Way ANOVA	F(2, 45) = 1.003	p = 0.375
Open field test	Locomotor activity	One-way ANOVA	F(2,45) = 5.790	p = 0.006
	Time in center	One-way ANOVA	F(2,45) = 0.048	p = 0.953
Place memory recognition test	Object memory	One-way ANOVA	F(2,45) = 1.291	p = 0.285
Recognition memory locomotion	Diet	Repeated measures ANOVA	F(2,45) = 0.969	p = 0.387
	Session	Repeated measures ANOVA	F(2,90) = 18.108	p < 0.001
	Diet x Session	Repeated measures ANOVA	F(4,90) = 0.927	p = 0.452
Habituation in the Water maze	Thigmotaxis	One-way ANOVA	F(2,45) = 0.717	p = 0.494
Locomotion during the visible platform in the water maze	Diet	Repeated measures ANOVA	F(2, 45) = 1.086	p = 0.346
	Trial	Repeated measures ANOVA	F(7, 315) = 12.663	p < 0.001
	Diet x Trial	Repeated measures ANOVA	F(14, 315) = 0.656	p = 0.817
Path length during the reference memory training	Diet	Repeated measures ANOVA	F(2, 45) = 0.456	p = 0.637
	Trial	Repeated measures ANOVA	F(29, 1305) = 7.683	p < 0.001
	Diet x Trial	Repeated measures ANOVA	F(58, 1305) = 0.960	p = 0.158
Latency during the reference memory training	Diet	Repeated measures ANOVA	F(2, 45) = 1.926	p = 0.158
	Trial	Repeated measures ANOVA	F(29, 1305) = 8.333	p < 0.001
	Diet x Trial	Repeated measures ANOVA	F(58, 1305) = 0.850	p = 0.781
Swimming velocity during the reference memory training	Diet	Repeated measures ANOVA	F(2, 45) = 1.943	p = 0.155
	Trial	Repeated measures ANOVA	F(29, 1305) = 6.380	p < 0.001
	Diet x Trial	Repeated measures ANOVA	F(58, 1305) = 0.701	p = 0.957
Long-term memory retention	Diet	Repeated measures ANOVA	F(2, 45) = 0.454	p = 0.638
	Quadrant	Repeated measures ANOVA	F(1,45) = 14.469	p < 0.001
	Diet x Quadrant	Repeated measures ANOVA	F(2,45) = 0.375	p = 0.689
	Platform crossings	One-way ANOVA	F(2, 45) = 1.063	p = 0.354
Short-term acquisition	Diet	Repeated measures ANOVA	F(2,45) = 0.904	p = 0.412

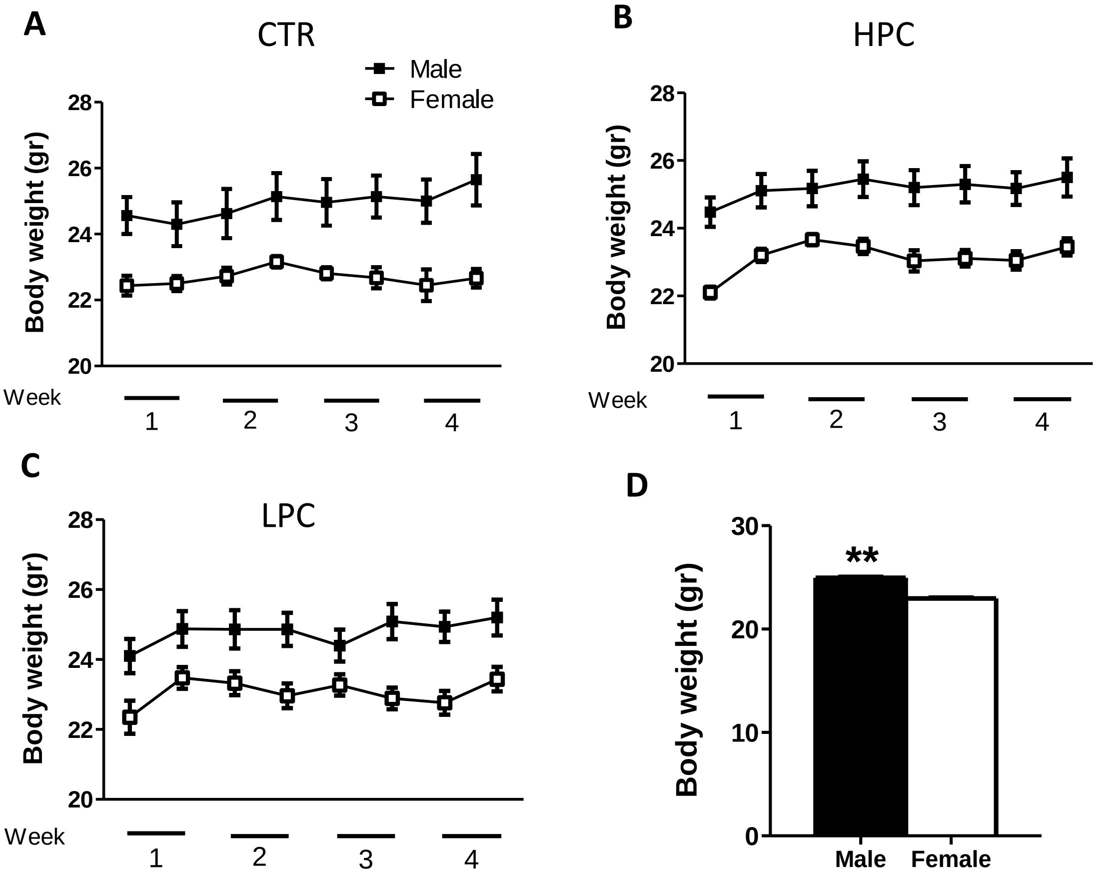
	Quadrant	Repeated measures ANOVA	F(1,45) = 0.000	p = 0.991
	Diet x Quadrant	Repeated measures ANOVA	F(2,45) = 0.539	p = 0.587
	Platform crossings	One-way ANOVA	F(2,45) = 0.819	p = 0.447
Adult hippocampal neurogenesis markers	Type 1 DCX+ neurons	One-way ANOVA	F(2,21) = 0.956	p = 0.400
	BrdU/NeuN	One-way ANOVA	F(2,9) = 0.885	p = 0.446
Basal synaptic transmission	Diet	Repeated measures ANOVA	F(2,20) = 0.239	p = 0.790
	Voltage	Repeated measures ANOVA	F(6, 120) = 751.40	p < 0.001
	Diet x Voltage	Repeated measures ANOVA	F(12, 120) = 0.239	p = 0.996
Long-term potentiation (LTP)	Diet	Repeated measures ANOVA	F(2,20) = 0.867	p = 0.436
	Time	Repeated measures ANOVA Repeated measures ANOVA	F(124, 2480) = 77.791	p < 0.001
	Diet x Time	Repeated measures ANOVA	F(248, 2480) = 0.885	p = 0.894
Paired-pulse facilitation (PPF)	Diet	Repeated measures ANOVA	F(2,20) = 0.177	p = 0.839
	Time	Repeated measures ANOVA	F(11, 220) = 8.363	p < 0.001
	Diet x Time	Repeated measures ANOVA	F(22, 220) = 0.785	p = 0.742

Supplementary Table 2

Supplementary Table 2. Summary of the nutritional composition based in labelling of the selected cocoas, per 100 g of product.

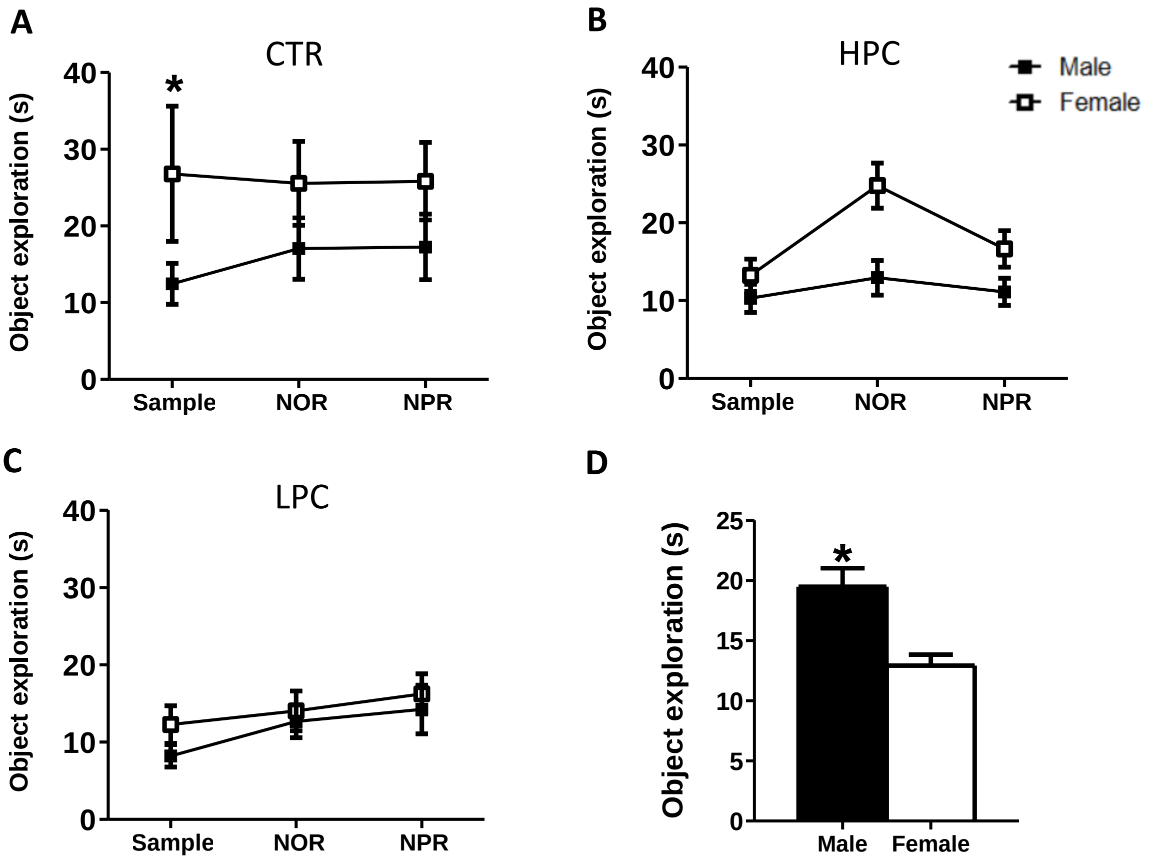
	HPC	**LPC**
Energy (KJ)	1338.88	1251.02
Fat (g)	12	12
Saturated fat (g)	7	7.4
Carbohydrates (g)	28	14.1
Sugars (g)	1.4	1.9
Protein (g)	19	22

Supplementary Figure 1



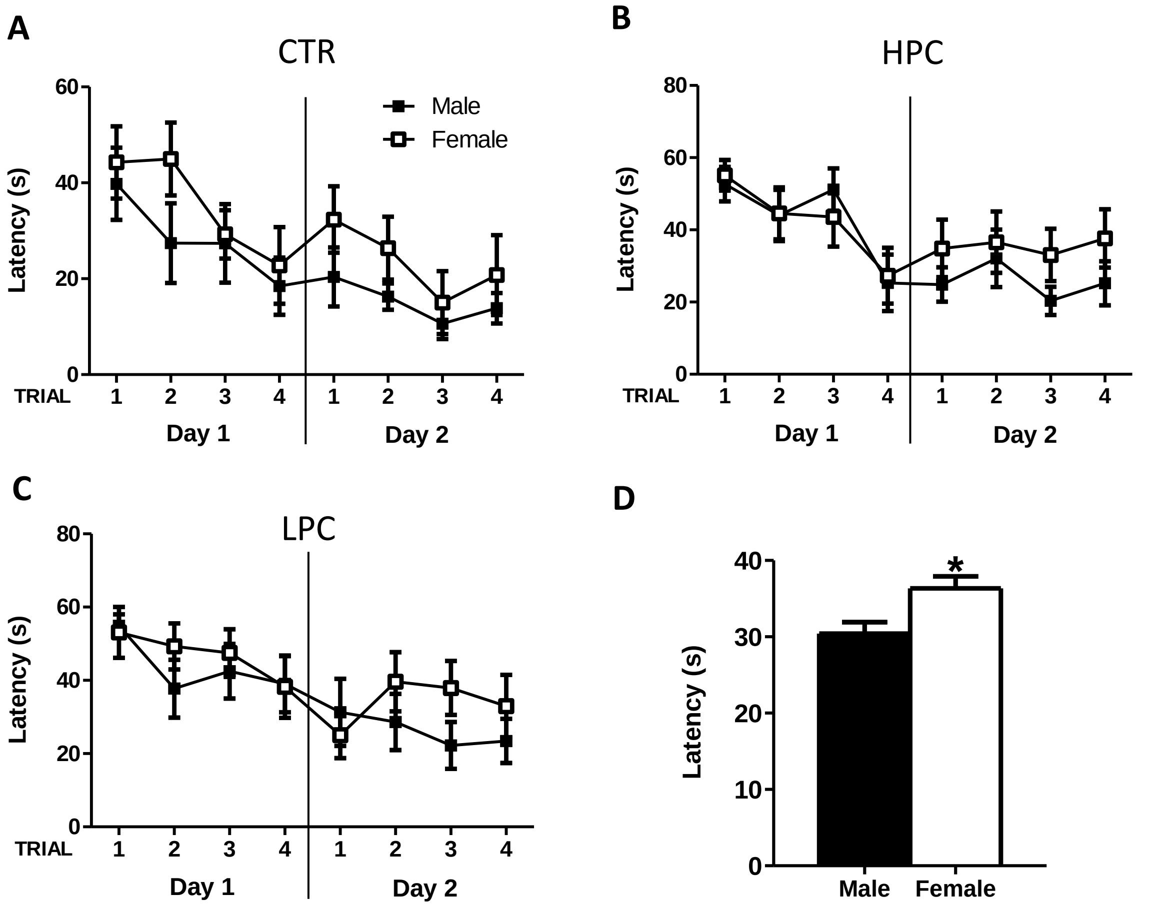
Supplementary Figure 1. Body weight differences with regard to sex. Irrespective of their dietary treatment, male mice exhibited a higher body weight compared to females [repeated measures ANOVA 'diet x day x sex' on body weight data: effect for 'diet': $F(2, 42) = 0.315$, $p = 0.731$; 'day': $F(7, 294) = 15.169$, $p < 0.001$; 'sex': $F(1,42) = 29.304$, $p < 0.001$; 'diet x day': $F(14, 294) = 2.546$, $p = 0.002$; 'diet x sex': $F(2, 42) = 0.143$, $p = 0.867$; 'sex x day': $F(7, 294) = 3.003$, $p = 0.005$, 'diet x sex x day': $F(14, 294) = 0.987$, $p = 0.466$]. For clarity, graphs A-C show data per individual diet treatment and day, while (D) shows data collapsed by sex. Results are expressed as mean ± SEM; differences between sexes across all groups: $^{**}p \leq 0.001$ (D).

Supplementary Figure 2



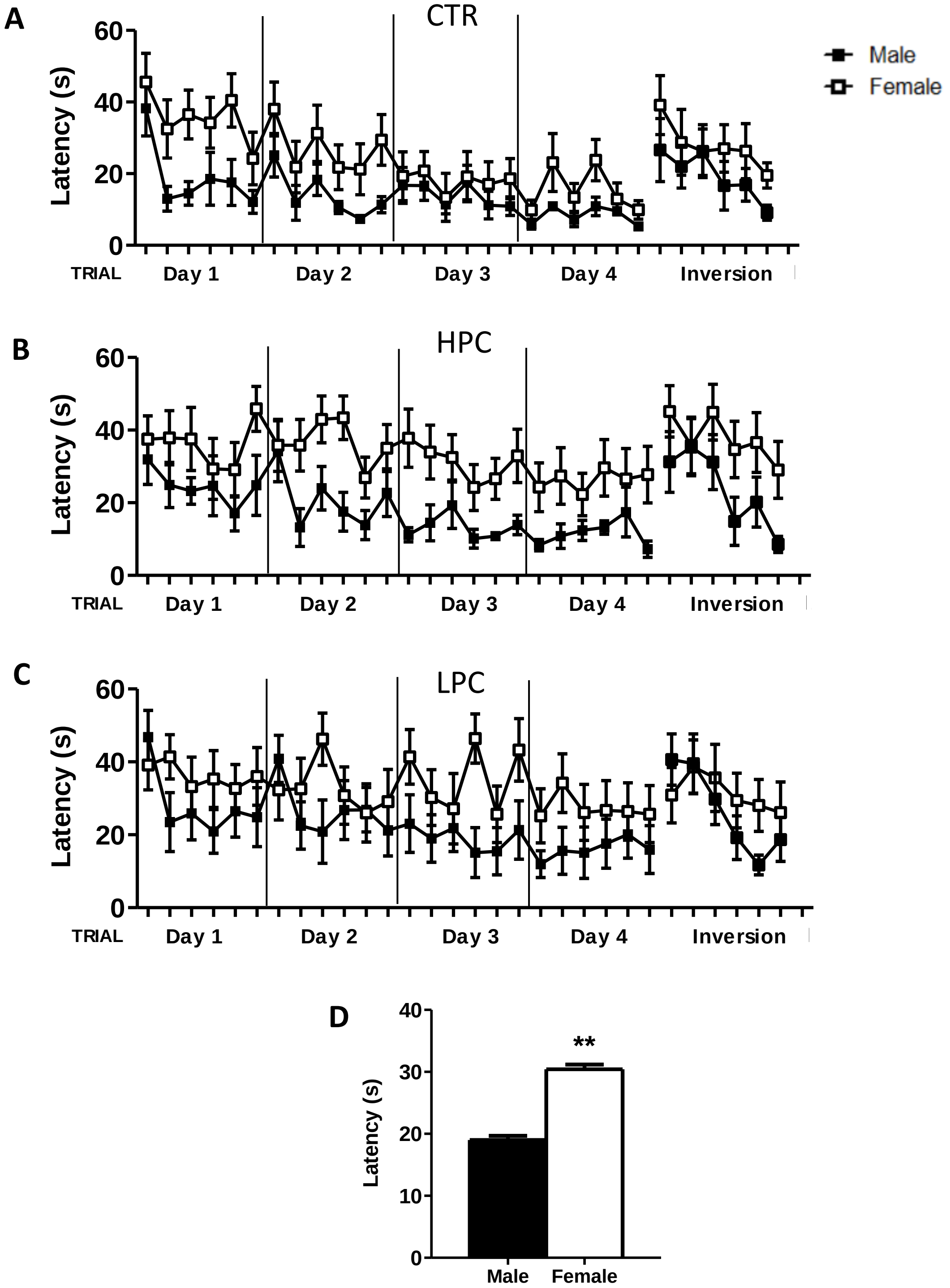
Supplementary Figure 2. Time spent exploring objects, differentiated by sex. When examining the cumulative data across all groups and sessions, males consistently spent more total time exploring objects than females [repeated measures ANOVA 'diet x trial x sex' on object exploration data: effect for ‘diet’: $F(2, 42) = 3.591$, $p = 0.036$; ‘session’: $F(2, 84) = 4.379$, $p = 0.016$; ‘sex’: $F(1,42) = 6.899$, $p = 0.012$; ‘diet x session’: $F(4, 84) = 1.340$, $p = 0.262$; ‘diet x sex’: $F(2, 42) = 0.852$, $p = 0.434$; ‘sex x session’: $F(2, 84) = 0.280$, $p = 0.756$, ‘diet x sex x trial’: $F(4, 84) = 1.318$, $p = 0.270$]. For clarity, graphs A-C are shown per individual diet treatment. Results are expressed as mean ± SEM; differences between sexes across all groups: *$p \leq 0.05$.

Supplementary Figure 3



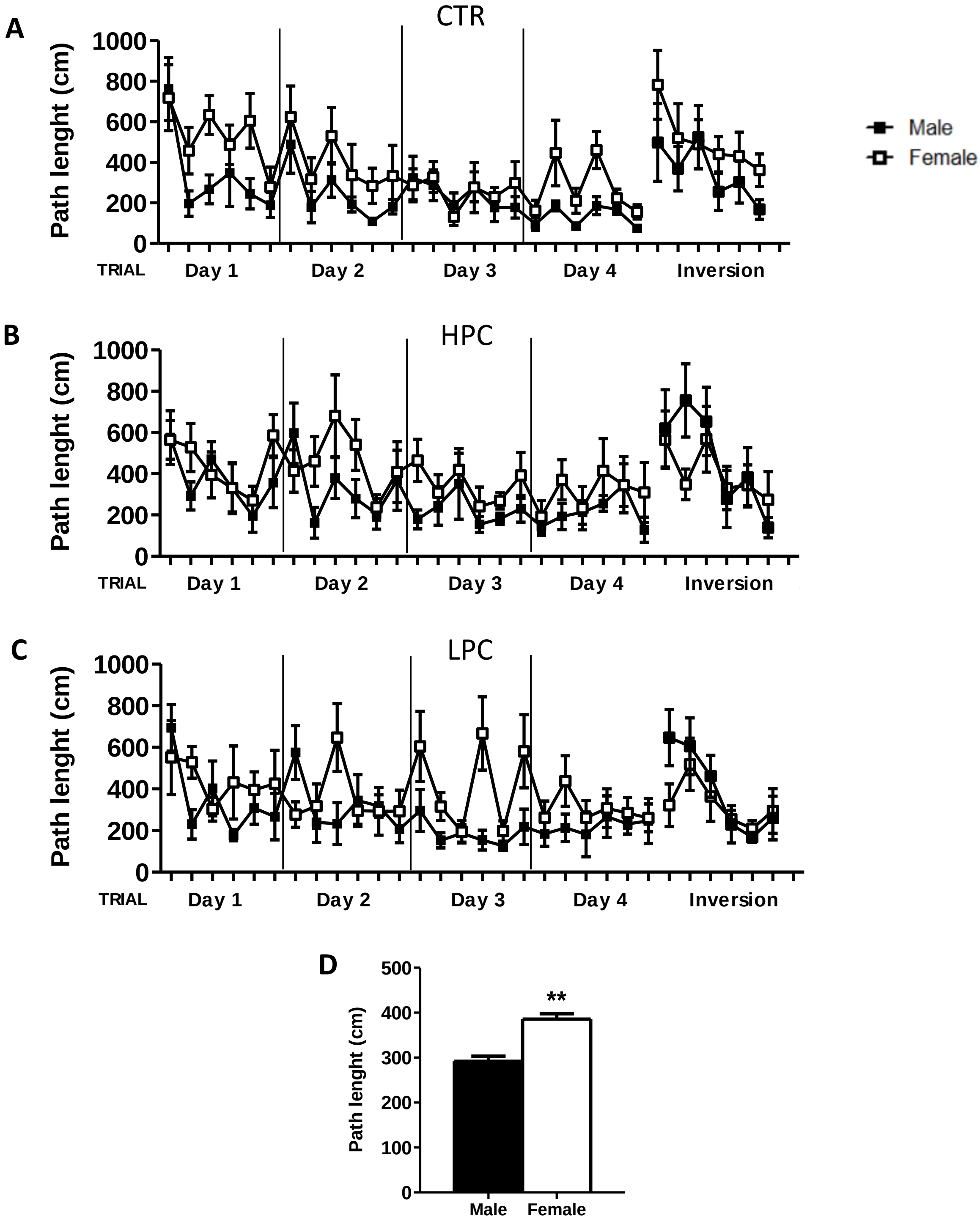
Supplementary Figure 3. Latency results in the water maze during the visible platform training presented by sex. When considering all groups collectively, female mice demonstrated an increased time required to reach the platform compared to males [repeated measures ANOVA 'diet x trial x sex' on latency data: effect for 'diet': $F(2, 42) = 8.605$, $p < 0.001$; 'trial': $F(7, 294) = 12.26$, $p < 0.001$; 'sex': $F(1,42) = 5.015$, $p = 0.030$; 'diet x trial': $F(14, 294) = 0.635$, $p = 0.835$; 'diet x sex': $F(2, 42) = 0.119$, $p = 0.888$; 'sex x trial': $F(7, 294) = 0.672$, $p = 0.696$, 'diet x sex x trial': $F(14, 294) = 0.448$, $p = 0.958$. For clarity, graphs A-C are shown per individual diet treatment. Results are expressed as mean ± SEM; differences between sexes across all groups: *$p \leq 0.05$ (D).

Supplementary Figure 4



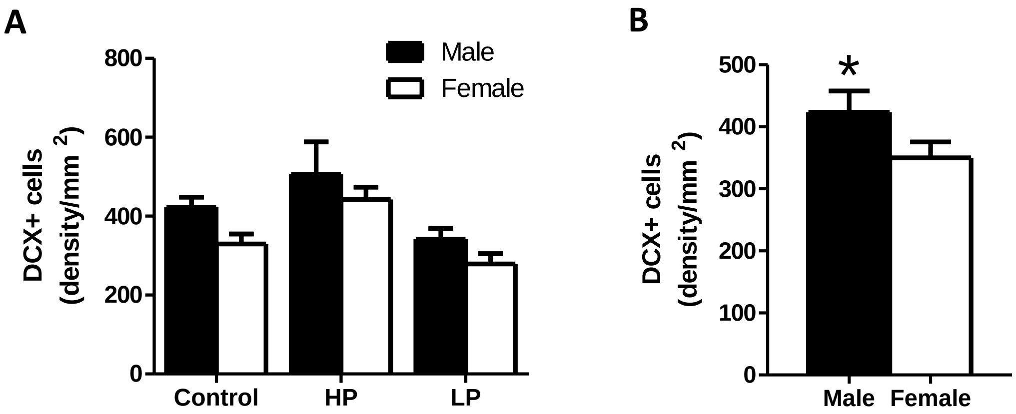
Supplementary Figure 4. During reference memory training, irrespective of their dietary treatment, female mice consistently exhibited an extended time to reach the platform compared to males [repeated measures ANOVA 'diet x trial x sex' on latency measures: effect for ‘diet’: $F(2, 42) = 2.370$, $p = 0.106$; ‘trial’: $F(29, 1218) = 8.303$, $p < 0.001$; ‘sex’: $F(1,42) = 12.769$, $p < 0.001$; ‘diet x trial’: $F(58, 1218) = 0.847$, $p = 0.786$; ‘diet x sex’: $F(2, 42) = 0{,}302$, $p = 0.741$; ‘sex x trial’: $F(29, 1218) = 1.106$, $p = 0.319$, ‘diet x sex x trial’: $F(58, 1218) = 0.868$, $p = 0.749$]. For clarity, graphs A-C are shown per individual diet treatment. Results are expressed as mean ± SEM; differences between sexes across all groups: $^{**}p \leq 0.001$ (D).

Supplementary Figure 5



Supplementary Figure 5. (A-C) Path length during the reference memory training showed no significant variation between sexes within the same group. (D) Nonetheless, when considering the overall data across all groups, female mice swam greater distance compared to male [repeated measures ANOVA 'diet x trial x sex' on path length data: effect for ‘diet’: $F(2, 42) = 1.931$, $p = 0.158$; ‘trial’: $F(29, 1218) = 7.028$, $p < 0.001$; ‘sex’: $F(1,42) = 27.118$, $p < 0.001$; ‘diet x trial’: $F(58, 1218) = 1.156$, $p = 0.204$; ‘diet x sex’: $F(2, 42) = 6.056$, $p = 0.005$; ‘sex x trial’: $F(29, 1218) = 1.893$, $p = 0.003$, ‘diet x sex x trial’: $F(46, 966) = 0.869$, $p = 0.746$. For clarity, graphs A-C are shown per individual diet treatment. Results are expressed as mean ± SEM; differences between sexes across all groups: $^{**}p \leq 0.001$ (D).

Supplementary Figure 6



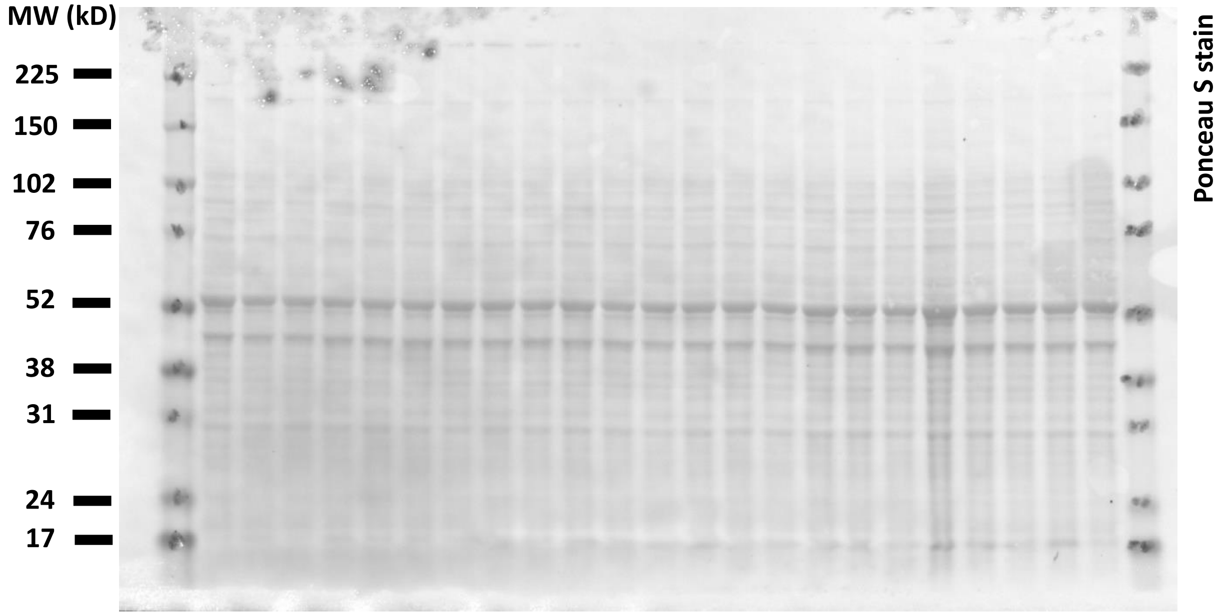
Supplementary Figure 6. While there were no sex differences in the total number of DCX+ cells within individual groups (A), the overall data revealed a higher total count of these cells in males compared to females (B). Two-Way ANOVA: 'Sex': $F(1, 20) = 5.133$, $p = 0.035$; 'diet': $F(2,20) = 8.701$, $p = 0.002$. Results are expressed as mean ± SEM; differences between sexes across all groups: *$p \leq 0.05$.

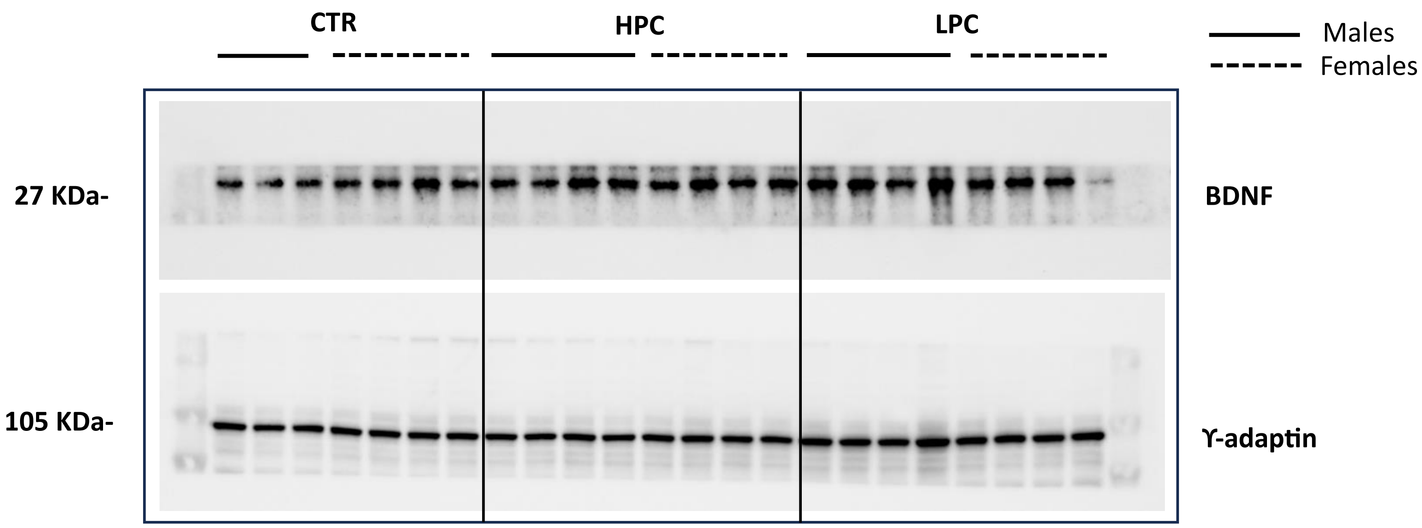
Extra information

Considering the significant sample size (n = 42), BDNF and γ-adaptin immunoblottings were performed on distinct membranes. Specifically, two membranes were designated for hippocampal analysis (Gels 1-2), while two were used for the prefrontal cortex (Gels 3-4). Red Ponceau Staining and individual membranes are shown below. BDNF and γ-adaptin immunoblottings conducted on Gels 1 and 4 are represented in Fig.4.

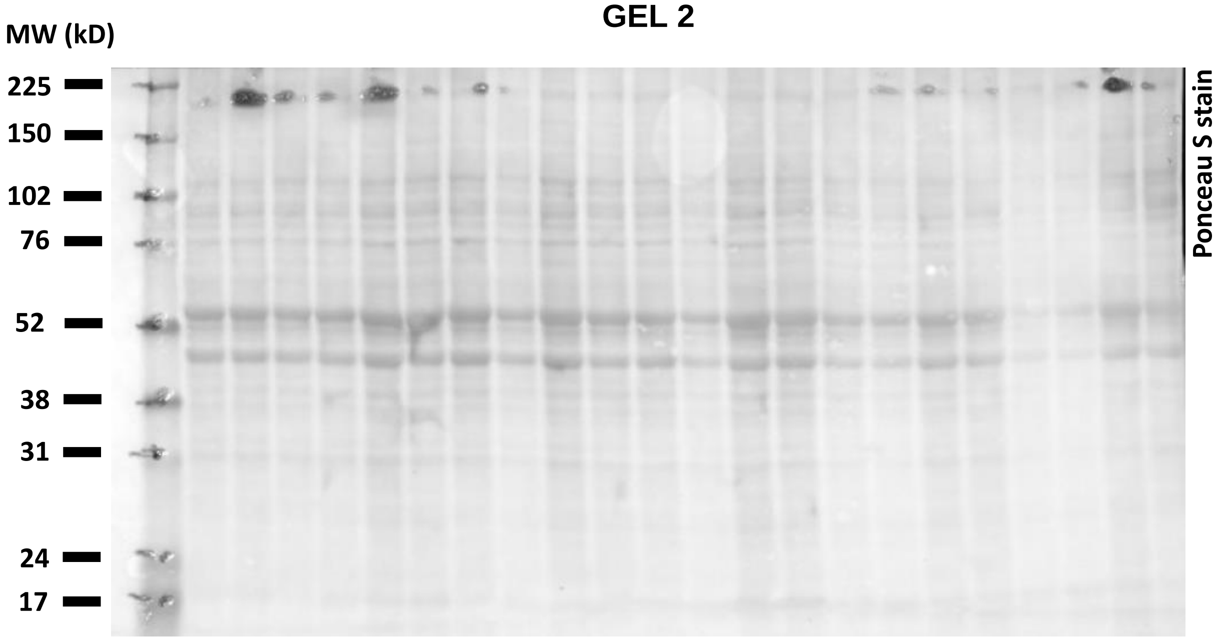
HIPPOCAMPUS (unedited blots)

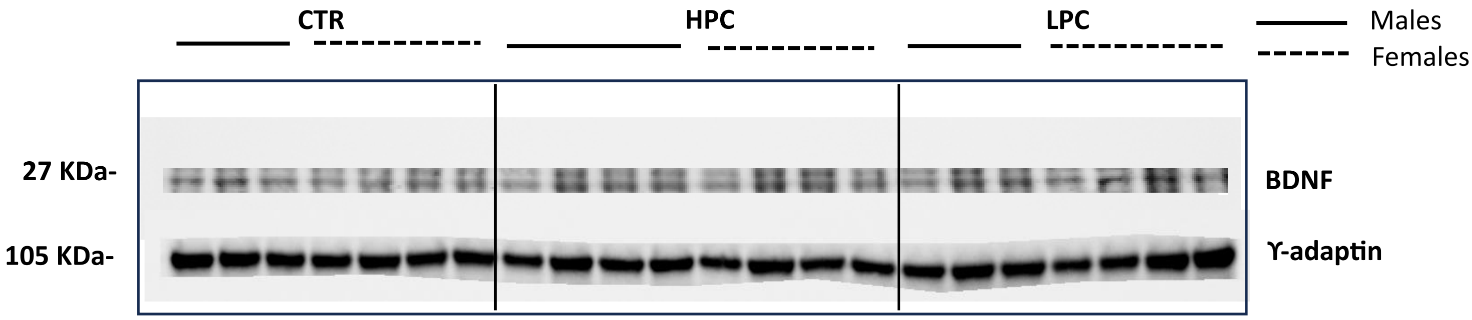
GEL 1





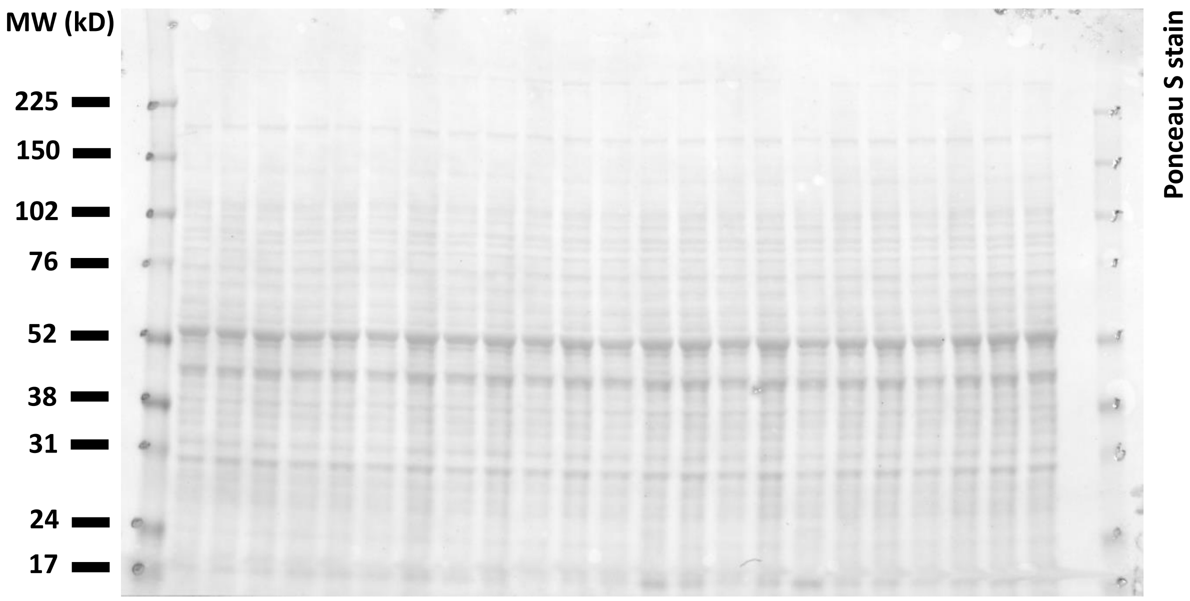
GEL 2

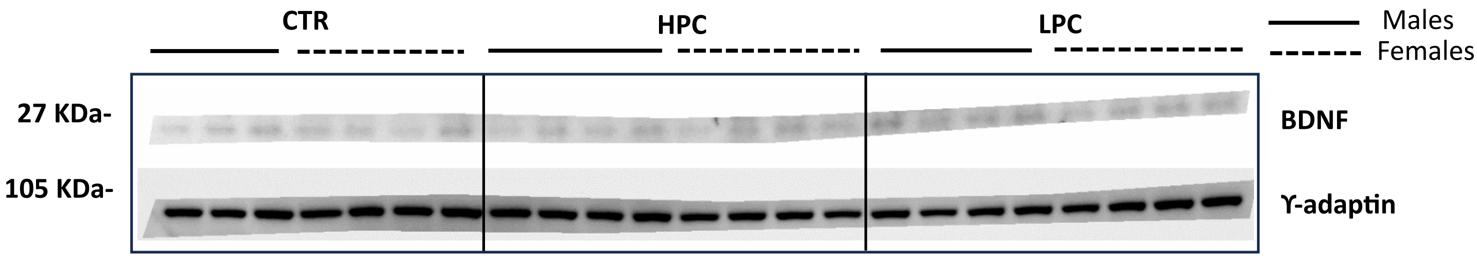




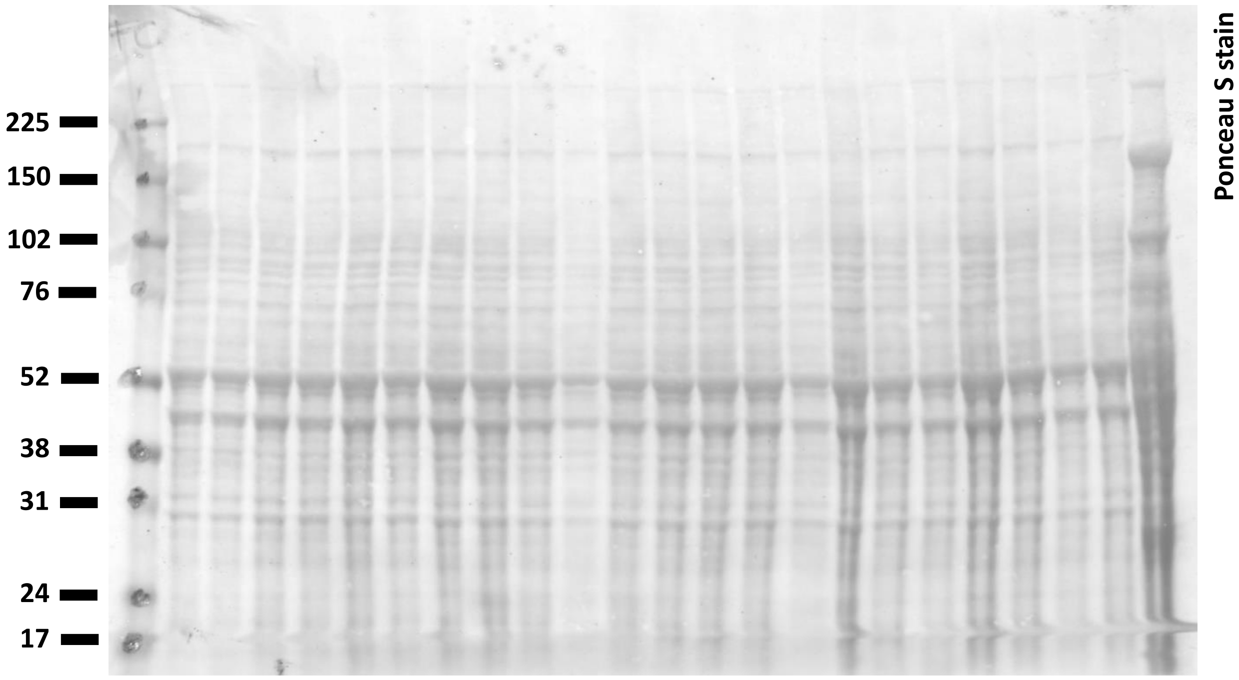
PREFRONTAL CORTEX (unedited blots)

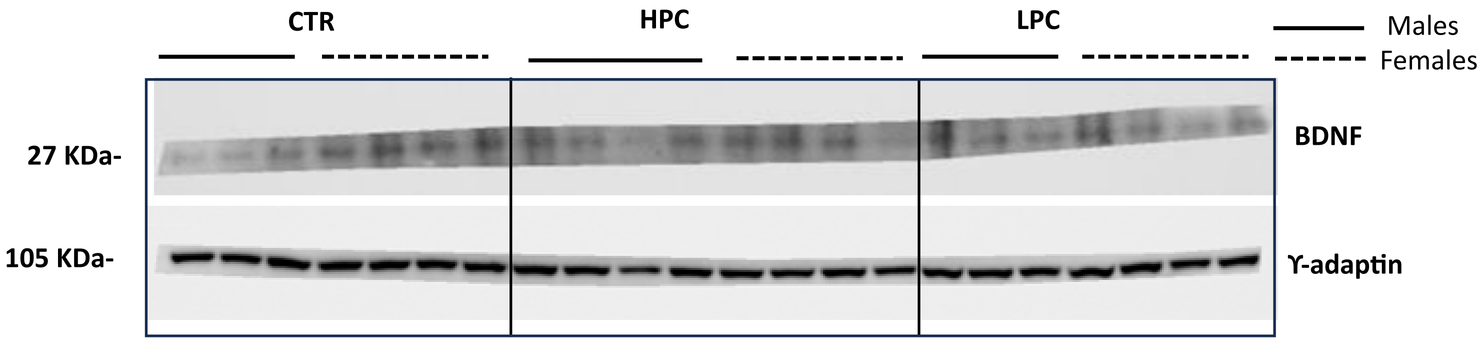
GEL 3




CTR
HPC
LPC
Males
Females
27 KDa-
105 KDa-
BDNF
Υ-adaptin

GEL 4


225
150
102
76
52
38
31
24
17
Ponceau S stain


CTR
HPC
LPC
Males
Females
27 KDa-
105 KDa-
BDNF
Υ-adaptin