Supplemental Materials

Materials and Methods

Image Acquisition and Processing

Processing. Additional whole-brain and follow-up analyses examining blast exposure groups were conducted. The number of total blast exposure was categorized into groups in two ways: (1) as a dichotomous variable of yes (n=145) and no (n=35) and (2) into quartiles (25, 50, 75) categorizing blast exposure as none (0 blast exposure, n=35), low (1-4 blast exposure, n=54), moderate (5-14 blast exposures, n=44), and high (15-500 blast exposures, n=43). Age, scanner, sex, CAPS score, and blast exposure group (either yes/no or no/low/moderate/high) were entered into the model as regressors and group-level activation maps were generated for group contrasts (No vs. Yes; No vs. Low, No vs. Moderate, No vs. High; Low vs. High, Low vs. Moderate; Moderate vs. High). Smoothness estimates were generated from the residuals using FSL's smoothest command line utility. Z statistic images were thresholded using clusters determined by $Z < 3.1$ ($p < 0.001$) with a corrected cluster significance threshold of $p = 0.05$ using FSL's cluster tool.

Follow-up analysis of covariance (ANCOVA) was also performed in which we examined blast exposure group (yes/no or no/low/moderate/high groups in separate models) on each significant cluster that survived multiple comparison correction in the whole-brain continuous blast exposure analysis. Age, scanner, sex, and current PTSD symptom severity were included as covariates and blast exposure group (either dichotomous or categorical grouping) was included as the factor. Post-hoc tests using Least Significance Difference (LSD) for pairwise comparisons between no/low/moderate/high groups were performed.

Results

Whole-Brain Analyses Without Removal of Outliers

Number of total blast exposures. We re-ran the whole-brain analysis examining perfusion associations with the number of total blast exposures including the whole sample (n = 180) without the removal of the n = 4 outliers on the number of total blast exposures. Results revealed a similar pattern (**Supplemental Materials Figure S1**) such that with an increasing number of total blast exposures, there was increased perfusion in several clusters: the right anterior cingulate cortex/insula (number of voxels = 3081, Z-Max = 5.54, peak MNI coordinates = 48 -4 10), right hippocampus/parahippocampal gyrus (number of voxels = 434, Z-Max = 5.99, peak MNI coordinates = 30 -32 -6), left frontal pole (number of voxels = 365, Z-Max = 5.4.44, peak MNI coordinates = -40 58 2), right middle/inferior temporal gyrus (number of voxels = 250, Z-Max =4.5, peak MNI coordinates = 60 -50 2), left frontal orbital cortex (number of voxels = 223, Z-Max = 4.2, peak MNI coordinates = -32 24 -16), left posterior cingulate gyrus (number of voxels = 211, Z-Max = 4.51, peak MNI coordinates = -14 -46 0), right middle/superior temporal gyrus (number of voxels = 210, Z-Max = 4.38, peak MNI coordinates = 58 -8 -16), and the left middle/inferior frontal gyrus (number of voxels = 191, Z-Max = 4.54, peak MNI coordinates = -54 32 22). There were no significant negative associations between perfusion and the number of total blast exposures.

Number of CBEs. We re-ran the whole-brain analysis examining perfusion associations with the number of CBEs including the whole sample (n = 180) without the removal of the n = 2 outliers on the number of CBEs. Results revealed several significant clusters that survived correction such that with an increasing number of CBEs, there was increased perfusion in several brain regions: the left inferior frontal gyrus/pars opercularis (number of voxels = 2193, Z-Max = 4.73, peak MNI coordinates = -44 16 8), right frontal pole (number of voxels = 1967, Z-Max =

5.86, peak MNI coordinates = 32 52 -16), left supramarginal gyrus/superior temporal gyrus (number of voxels = 430, Z-Max = 4.61, peak MNI coordinates = -52 -36 42), right superior temporal gyrus (number of voxels = 318, Z-Max = 3.84, peak MNI coordinates = 46 2 -20), left frontal pole (number of voxels = 212, Z-Max = 4.62, peak MNI coordinates = -4 64 -20), right parahippocampal gyrus (number of voxels = 167, Z-Max = 4.22, peak MNI coordinates = 30 -28 -12). There were no significant negative associations between perfusion and the number of CBEs.

Yes/No Blast Exposure

Whole-brain analysis. There were no significant blast exposure group differences in perfusion after correction for multiple comparison.

Follow-up ANCOVAs. There were no significant effects of blast exposure group on perfusion in any of the significant clusters that survived multiple comparison correction in the whole-brain continuous blast exposure analysis: right middle frontal gyrus/superior frontal gyrus: $F(1,170) = 0.134$, $p = 0.715$, partial eta squared = 0.001; left anterior cingulate cortex/frontal orbital cortex/insula: $F(1,170) = 0.184$, $p = 0.668$, partial eta squared = 0.001; right anterior cingulate cortex/frontal orbital cortex/insula: $F(1,170) = 0.276$, $p = 0.600$, partial eta squared = 0.002; right lateral occipital cortex: $F(1,170) = 0.017$, $p = 0.895$, partial eta squared = 0.000; right angular gyrus/supramarginal gyrus: $F(1,170) = 0.008$, $p = 0.929$, partial eta squared = 0.000; right precuneus/posterior cingulate cortex: $F(1,170) = 0.875$, $p = 0.351$, partial eta squared = 0.005; bilateral occipital pole: $F(1,170) = 0.023$, $p = 0.880$, partial eta squared = 0.000; right superior temporal gyrus/middle temporal gyrus cluster: $F(1,170) = 0.609$, $p = 0.436$, partial eta squared = 0.004; left superior temporal gyrus/middle temporal gyrus cluster: $F(1,170) = 0.148$, $p = 0.701$, partial eta squared = 0.001.

No/Low/Moderate/High Blast Exposure

Whole-brain analysis. There was a significant cluster that survived multiple comparison correction such that individuals in the high blast exposure group had increased perfusion in the left anterior cingulate cortex extending into the frontal orbital cortex and insula compared to those without any blast exposure (number of voxels = 168, Z-Max = 3.75, peak MNI coordinates = -6 28 -12). Moreover, the high blast exposure group had increased perfusion in the left inferior frontal gyrus/frontal orbital cortex and the left angular gyrus/supramarginal gyrus compared to low (left inferior frontal gyrus/frontal orbital cortex: number of voxels = 235, Z -Max = 4.07, peak MNI coordinates = -32 34 0; left angular gyrus/supramarginal gyrus: number of voxels = 184, Z -Max = 4.61, peak MNI coordinates = -54 -52 22) and moderate (left inferior frontal gyrus/frontal orbital cortex: number of voxels = 406, Z -Max = 4.09, peak MNI coordinates = -34 34 0) blast exposed groups. There were no significant decreases in perfusion in high blast exposed individuals compared to those without any, low or moderate blast exposure or any significant group differences in perfusion between no blast exposure, low or moderate blast-exposed groups.

Follow-up ANCOVAs. Follow-up ANCOVAs revealed a significant overall model and a significant effect of blast exposure group for seven of the nine clusters from the primary whole-brain continuous blast exposure analysis, driven by increased perfusion in the high blast exposure group compared to no, low, and moderate groups: right middle frontal gyrus/superior frontal gyrus: overall $F(7,168) = 5.923$, $p < 0.001$, $F(3,168) = 3.438$, $p = 0.018$, partial eta squared = 0.058, High to No mean difference = 5.341, $p = 0.136$, High to Low mean difference = 8.037, $p = 0.01$, High to Moderate mean difference = 9.454, $p = 0.004$; left anterior cingulate cortex/frontal orbital cortex/insula: overall $F(7,168) = 4.534$, $p < 0.001$, $F(3,168) = 4.453$, $p =$

0.005, partial eta squared = 0.074, High to No mean difference = 5.897, $p = 0.024$, High to Low mean difference = 5.407, $p = 0.017$, High to Moderate mean difference = 8.347, $p < 0.001$; right anterior cingulate cortex/frontal orbital cortex/insula: overall $F(7,168) = 3.785$, $p = 0.001$, $F(3,168) = 2.979$, $p = 0.033$, partial eta squared = 0.051, High to No mean difference = 5.004, $p = 0.042$, High to Low mean difference = 4.572, $p = 0.032$, High to Moderate mean difference = 6.241, $p = 0.005$; right lateral occipital cortex: overall $F(7,168) = 5.877$, $p < 0.001$, $F(3,168) = 2.779$, $p = 0.043$, partial eta squared = 0.047, High to No mean difference = 5.114, $p = 0.089$, High to Low mean difference = 5.706, $p = 0.029$, High to Moderate mean difference = 7.399, $p = 0.007$; right angular gyrus/supramarginal gyrus: overall $F(7,168) = 3.672$, $p = 0.001$, $F(3,168) = 3.331$, $p = 0.021$, partial eta squared = 0.056, High to No mean difference = 7.195, $p = 0.062$, High to Low mean difference = 8.981, $p = 0.007$, High to Moderate mean difference = 9.681, $p = 0.006$; right precuneus/posterior cingulate cortex: overall $F(7,168) = 3.239$, $p = 0.003$, $F(3,168) = 2.674$, $p = 0.049$, partial eta squared = 0.046, High to No mean difference = 2.234, $p = 0.486$, High to Low mean difference = 5.585, $p = 0.045$, High to Moderate mean difference = 7.359, $p = 0.012$; left superior temporal gyrus/middle temporal gyrus cluster: overall $F(7,168) = 2.373$, $p = 0.024$, $F(3,168) = 3.808$, $p = 0.011$, partial eta squared = 0.064, High to No mean difference = 5.085, $p = 0.119$, High to Low mean difference = 7.585, $p = 0.008$, High to Moderate mean difference = 9.113, $p = 0.002$. However, only the left anterior cingulate cortex/frontal orbital cortex/insula cluster would survive Bonferroni multiple comparison correction, correcting across nine significant clusters.

The effect just missed the standard threshold for significance in the right superior/middle temporal gyrus (overall $F(7,168) = 4.251$, $p < 0.001$, $F(3,168) = 2.515$, $p = 0.06$, partial eta squared = 0.043, High to No mean difference = 3.014, $p = 0.391$, High to Low mean difference =

7.445, $p = 0.015$, High to Moderate mean difference = 6.626, $p = 0.038$) and was not significant for the bilateral occipital pole (overall $F(7,168) = 3.256$, $p = 0.003$, $F(3,168) = 1.697$, $p = 0.17$, partial eta squared = 0.029). There were no significant group differences in perfusion between no, low, and moderate blast exposure groups.

Figures

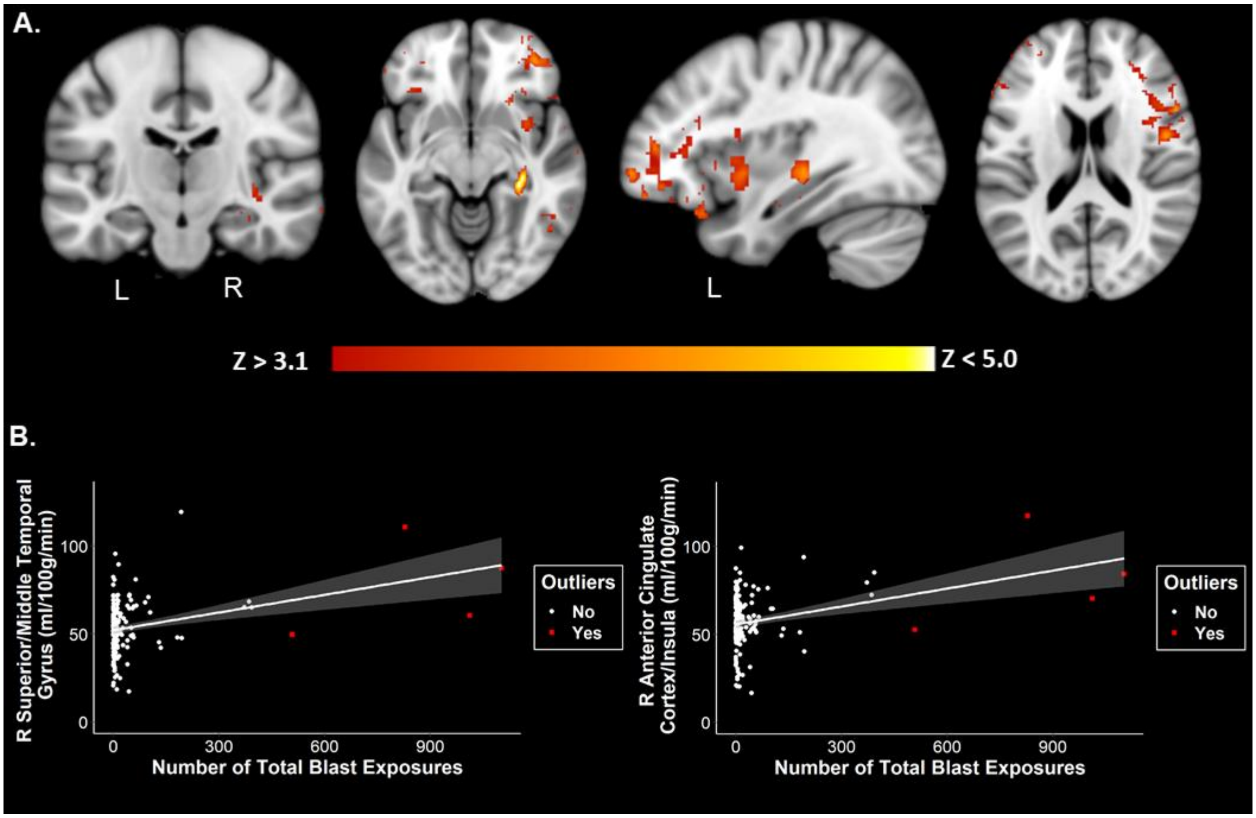

Figure S1. Positive whole-brain associations between blast exposure and perfusion including the whole sample without removing blast exposure outliers (n = 180). There was a significant positive association between the number of total blast exposures and perfusion in regions such as the middle/superior temporal gyrus, superior/middle frontal gyrus, anterior cingulate cortex, insula, and hippocampus even without removing blast exposure outliers. **(A)** Coronal, axial, and sagittal slices of perfusion in association with number of total blast exposures in the entire sample without removal of outliers (n = 180) are shown in MNI space, controlling for age, scanner, sex, and current PTSD symptom severity. Color scale indicates *Z*-score threshold. **(B)** Corresponding scatter plots of selected regions (that correspond to the primary analysis in the main text), with 95% confidence intervals shaded in gray, show the positive association between the number of total blast exposures and perfusion. Outliers on the number of total blast exposures (> 500 blasts, n = 4) that were removed in the primary analysis in the main text are highlighted in red. Other brain regions showed similar positive associations as those represented in the scatter plots and are not shown here. L=left; R=right.

Tables

Table S1. *Significant whole-brain associations between perfusion and age.*

Contrast	Cluster Size	*Z* Max	X	Y	Z	Brain Region
Positive main effect of age	---	---	---	---	---	---
Negative main effect of age	3717	5.68	30	-98	-8	Right occipital pole extending into the left occipital pole, bilateral occipital cortex and cerebellum
	3639	4.90	-38	38	-12	Left frontal pole extending into frontal orbital cortex, anterior cingulate cortex, superior frontal gyrus and right frontal pole
	468	4.94	-54	4	-32	Left temporal pole/ middle temporal gyrus
	236	5.05	-44	-24	-30	Left inferior temporal gyrus/temporal fusiform cortex
	222	3.73	26	40	46	Right frontal pole/middle frontal gyrus
	216	3.95	-34	6	-4	Left insula

Note: Coordinates are in Montreal Neurological Institute (MNI) space. Cluster size is number of voxels in standard space (2mm^3 voxels). Only peak coordinates of clusters are listed. Subclusters are not reported. There were no significant positive associations between age and perfusion.

Table S2. *Significant whole-brain associations between perfusion and scanner.*

Contrast	Cluster Size	*Z* Max	X	Y	Z	Brain Region
Siemens 3T Prisma > Siemens 3T Trio	---	---	---	---	---	---
Siemens 3T Prisma < Siemens 3T Trio	214	4.97	38	-42	-50	Right cerebellum

Note: Coordinates are in Montreal Neurological Institute (MNI) space. Cluster size is number of voxels in standard space ($2mm^3$ voxels). Only peak coordinates of clusters are listed. Subclusters are not reported. The Prisma scanner did not have significantly greater perfusion than the Trio in any brain region.

Table S3. *Significant whole-brain associations between perfusion and sex.*

Contrast	Cluster Size	*Z* Max	X	Y	Z	Brain Region
Females > Males	6432	6.72	-8	-90	-28	Left Cerebellum extending into the right cerebellum
	1923	5.22	-10	-88	40	Left lateral occipital cortex extending into right lateral occipital cortex
	634	4.82	28	-46	6	Right precuneous/middle temporal gyrus
	472	3.76	-22	66	-14	Left frontal pole
	296	4.20	24	-66	14	Right supracalcarine cortex
	220	5.06	24	62	-18	Right frontal pole
Females < Males	---	---	---	---	---	---

Note: Coordinates are in Montreal Neurological Institute (MNI) space. Cluster size is number of voxels in standard space ($2mm^3$ voxels). Only peak coordinates of clusters are listed. Subclusters are not reported. Males did not have significantly greater perfusion in any brain region compared to females.

Table S4. *Significant whole-brain associations between perfusion and BMI.*

Contrast	Cluster Size	*Z* Max	X	Y	Z	Brain Region
Positive main effect of BMI	---	---	---	---	---	---
Negative main effect of BMI	690	4.28	26	-92	10	Right occipital pole/lateral occipital cortex
	491	3.96	52	-62	-34	Right cerebellum
	333	4.47	54	-60	16	Right lateral occipital cortex/angular gyrus
	237	3.89	-22	-62	-34	Left cerebellum

Note: Coordinates are in Montreal Neurological Institute (MNI) space. Cluster size is number of voxels in standard space ($2mm^3$ voxels). Only peak coordinates of clusters are listed. Subclusters are not reported. There were no significant positive associations between BMI and perfusion. BMI=body mass index.