Appendix

Supplementary Table 1. Summary of Study Characteristics

Author, Year	Study design	SA Population (Diagnostic criteria)	SI Population (Diagnostic criteria)	Mean age (SD) SA; SI	% Male SA; SI	Imaging technique	Psychological pain measure	Time between psychological pain and imaging measure	Depression severity mean (SD) Measure: SA; SI	Mean Ideation severity (SD) Measure: SA; SI
Caceda et al., 2020 [27]	Cross-sectional study	10 SA (within 3 days) during a major depressive episode with mood disorder diagnosis (DSM-IV criteria)	9 SI during a major depressive episode with mood disorder diagnosis (DSM-IV criteria)	34.2 (10.9); 30.1 (9.4)	40%; 33%	Task-based fMRI (Cyberball)	Psychache scale, Physical and Psychological Pain Scale	Not reported	BDI: 34.9 (16.7); 39.8 (7.2)	C-SSRS: 1.0 (1.6); 1.5 (1.0)
Hao et al., 2023 [23]	Cross-sectional study	25 SA (DSM-5 criteria, BDI-I score > 17)	45 SI (DSM-5 criteria, BDI-I score > 17)	21.60 (6.94); 23.38 (4.58)	24%; 37.78%	Resting-state fMRI	TDPPS	Not reported	BDI: 37.24 (8.71); 32.02 (7.45)	BSI-C: 16.04 (8.68) (SA); 5.20 (6.67) (SI) BSI-W: 27.84 (6.34); 12.59 (10.63)
Hao et al., 2022 [22]	Cross-sectional study	25 SA (DSM-5 criteria, BDI-I score > 17)	39 SI (DSM-5 criteria, BDI-I score > 17)	21.60 (6.94); 23.67 (4.77)	24%; 36%	Resting-state fMRI	TDPPS	Not reported	BDI: 37.24 (8.71) 31.03 (6.87)	BSI-C: 16.12 (8.88); 7.26 (4.76) BSI-W: 27.64 (6.21); 17.63 (7.07)
Olié et al., 2021 [26]	Cross-sectional Cohort hybrid study	13 SA with a mood disorder and past history of major depressive episode (DSM-IV criteria). Patients euthymic at time of study	20 NSA with a mood disorder and past history of major depressive episode (DSM-IV criteria). Patients euthymic at time of study	41.45 (10.8); 34.92 (8.9)	0%; 0%	Task-based fMRI (Cyberball)	EMA Likert scale	Within 1 week	Not reported	Not reported
Richard-Devantoy et al., 2016 [25]	Cross-sectional	25 SA (DSM-IV criteria, HAM-D scale >20)	22 SI (DSM-IV criteria, HAM-D scale >20)	40.3 (9.7); 41.3 (11.4)	40%; 40%	Task-based fMRI (Go/No-Go)	Visual analog scale	Same day	HAM-D-24: 29.0 (8.5); 29.6 (5.2)	SSI current: 8.4 (8.0); 8.4 (7.9) SSI past 15 days: 19.9 (8.6); 10.1 (8.7)
Song et al., 2020 [24]	Cross sectional	12 SA (DSM-IV-R criteria, BDI-I >17)	32 SI (DSM-IV-R criteria, BDI-I >17)	24.58 (7.19); 23.72 (4.52)	16.7%; 40.6%	Task-based EEG (MID)	TDPPS	Not reported	BDI: 36.67 (5.87); 31.19 (6.52)	BSI-W: 26.08 (7.40); 6.06 (8.12) BSI-C: 15.58 (9.63); 1.66 (2.54)

Supplementary Table 2. Summary of Psychological Pain and Functional Neuroimaging Outcomes

Author, Year	Functional neural outcomes	Psychological pain outcome	Psychological pain and functional neural outcome associations	ROI
Caceda et al., 2020 [27]	Decreased right superior anterior insula activity in SA during inclusion.	SA had lower psychache than SI, with no difference in current, usual past 15 day, or maximal past 15 day psychological pain.	Right and left superior anterior insula activity during inclusion correlated positively with usual psychological pain in the last 15 days.	Pain matrix regions: dACC and left/right insula (posterior, inferior anterior, superior anterior)
Hao et al., 2023 [23]	N/A	SA had higher TDPPS scores than SI including all 3 subscales. Pain avoidance ranked first in attempt classification models with 63%–92% accuracy.	Top five features in suicide attempt and pain avoidance classification models overlapped, which included FC between the left amygdala and right insula, right OFC and left thalamus, left ACC and left insula, left ACC and right OFC, left ACC and right amygdala, and between the left ACC and left thalamus. The accuracy of brain-only suicide attempt and pain avoidance models was 56%–85%, and 49%–69% respectively.	Psychological pain processing circuit of pain matrix (Left/Right): bilateral OFC, ACC, insula, amygdala, thalamus Suicide-related ROI (Left/Right): Precuneus, Fusiform, Caudate, superior medial frontal, superior temporal Suicide and pain unrelated ROI (Left/Right): supramarginal, angular, calcarine, lingual, parahippocampal
Hao et al., 2022 [22]	SA had increased FC in the right ACC, superior frontal gyrus, left medial OFC, right superior OFC, and left thalamus, and weaker connectivity in the MCC, left precuneus, right insula compared with SI. SA had longer dwell time in state I (intra-network connectivity) and shorter state II (inter-network) dwell time than SI.	SA had higher TDPPS scores than SI including all 3 subscales.	ACC, superior frontal gyrus, and medial OFC connectivity positively correlated with total TDPPS scores and number of suicide attempts. Connectivity in the MCC, insula, and thalamus negatively correlated with total TDPPS scores and number of suicide attempts.	DMN: medial PFC, ACC, PCC, precuneus CEN: dlPFC, posterior parietal cortex SN: insula, ACC BGN: caudate, thalamus, amygdala
Olié et al., 2021 [26]	N/A	No significant difference.	SA: daily psychological pain negatively correlated with OFC activation during explicit social exclusion vs inclusion, while negative trending correlations in the dPFC and ACC were reported. NSA: No such correlations.	5 ROI (Social rejection and suicidal vulnerability) OFC: inferior frontal gyrus, middle frontal gyrus and medial frontal gyrus VLPFC: opercular part of the inferior frontal gyrus. DPFC: middle frontal gyrus ACC Insula
Richard-Devantoy et al., 2016 [25]	SA: Go v. No-Go contrast had increased activation difference in precuneus/posterior cingulate gyrus right post-central gyrus/superior temporal gyrus region, temporal cortex, medial supplementary motor area and left putamen. SI: No such within group differences.	No significant difference.	Levels of psychological pain correlated with activation in the left inferior frontal gyrus, medial thalamus in the go vs no-go contrast. No-Go vs baseline contrast showed left OFC, and right and left angular gyri activation correlated with psychological pain.	N/A
Song et al., 2020 [24]	SA: significantly larger cue-P3 when elicited by reward cues compared to punitive and neutral cues. SA: significantly larger feedback-P3 when elicited by negative feedback in punitive conditions compared to neutral and reward conditions. SI: significantly larger cue-P3 when elicited by reward cues compared to punitive cues. SI: significantly larger feedback-P3 when elicited by negative feedback in reward condition compared to neutral condition.	SA had higher TDPPS scores than SI.	Average amplitude of: Cue-P3 elicited by reward cues negatively correlated with TDPPS and on all subscales. Cue-P3 elicited by punitive cues negatively correlated with pain avoidance subscale of TDDPS. Feedback-P3 elicited by positive feedback in reward and punitive conditions significantly negatively correlated with TDDPS and painful feeling subscale. Feedback-P3 elicited by negative feedback in reward condition showed significant negative correlation with painful feeling subscale and positive correlation with SA.	Central parietal area