Supplemental Materials

Supplemental Methods

Participants

Potential participants were excluded for the following reasons: child not fluent in English, MRI contraindication (e.g., irremovable ferromagnetic implants or dental appliances, claustrophobia, pregnant), major neurological disorder, gestational age less than 28 weeks or birthweight less than 1,200 grams, history of traumatic brain injury, or had a current diagnosis of schizophrenia, autism spectrum disorder (moderate, severe), mental retardation/intellectual disability, or alcohol/substance use disorder.

EN-back

Participants completed two runs, each consisting of eight blocks. In each run, four blocks are "2-back" and four are "0-back" conditions. For the 2-back condition, participants were instructed to respond "match" when the current stimulus was the same as the stimulus shown two trials ago. During the 0-back condition, participants responded "match" when the current stimulus was the same as the target presented at the beginning of the block. Each block consisted of 10 trials, with 160 trials total, and began with a 500ms colored fixation to alert the child of a switch in task condition, followed by a 2.5s cue that indicates the condition (e.g., "2-back", "target=" and a photo of the target stimulus). The stimulus (i.e., positive face, negative face, neutral face, or place) was presented for 2s and is then followed immediately by a 500ms fixation cross.

Statistical Analyses

All follow-up behavioral analyses used hierarchical linear models (HLMs), with age, sex, race/ethnicity, and financial adversity included as covariates (average head motion and scanner

type were additionally included as covariates in analyses with ROIs), and with both family unit and site included as random intercepts. Follow-up analyses first examined repeated measures analyses of behavioral data, in which EN-back task accuracy was the outcome and n-back level (2 versus 0) and stimuli type (emotion versus neutral) were within-subject factors, to examine main effects and the interaction of n-back level and stimuli type on accuracy.

Follow-up behavioral analyses also examined whether behavioral task performance, as assessed by response accuracy, was associated with both social behavior and experience indices, as well as ROIs found to be significant in the manuscript. First, to examine whether emotion trial task performance was associated with social behaviors and experiences, HLMs examined associations between each social behavior and experience as outcomes with 2-back emotion trial accuracy as a predictor (as well as models with average emotion trial accuracy [i.e., an average of 2-back and 0-back emotion trial accuracy] as a predictor; Supplemental Table 11). We followed up these analyses by using HLMs to examine whether these results were specific to emotional stimuli task performance, examining whether associations between 2-back emotion trial accuracy with social behaviors and experiences remained consistent when additionally including 2-back neutral trial accuracy as a predictor (Supplemental Table 12). Next, to examine whether behavioral performance accounted for findings presented in the manuscript, HLMs examined whether results remained consistent with the results reported in the manuscript when including both 2-back emotion accuracy and ROI activation as predictors with significant social behaviors and experiences from our manuscript results (i.e., number of close friends, experiences of discrimination, reciprocal social impairments) as outcomes (Supplemental Table 13). Lastly, we examined whether better task performance during emotion stimuli trials was associated with ROIs used in the manuscript by examining associations between both 2-back emotion trial

accuracy and average emotion trial accuracy with a priori ROI activation using HLMs (Supplemental Table 14).

Supplemental Results

Behavioral results for EN-back task accuracy (i.e., means and standard deviations) by trial type (i.e., N-back level and stimuli type) can be found in Supplemental Table 9. Overall, as can be seen in Supplemental Table 10, analyses indicated there was a main effect of n-back condition (2-back versus 0-back), whereby as expected, accuracy was lower for 2-back versus 0-back. There was also a main effect of stimuli type (emotion versus neutral), whereby accuracy was lower for emotion versus neutral stimuli. There was also an interaction, whereby there was a larger effect of stimuli type for the 0-back compared to the 2-back trials, although overall the 2-back emotion trials showed the lowest accuracy of all conditions. These findings provide evidence that the 2-back emotion condition was the most challenging working memory condition.

Next, to examine whether social behavior and experience indices showed associations with an index of implicit emotion working memory, we next examined associations between 2-back emotion accuracy as the predictor with each of the social behavior and experience indices as outcome variables. As seen in Supplemental Table 11, higher overall 2-back emotion accuracy was significantly linked to higher prosocial behavior, higher number of activities in the past 12 months, more experiences of being bullied, less reciprocal social impairments, less social problems, and less experiences of discrimination. Number of close friends, overt victimization, and overt aggression were not strongly associated with 2-back emotion trial accuracy. Note, the results remained consistent when instead of 2-back emotion trial accuracy we examined overall emotion stimuli accuracy (i.e., an average of 2-back and 0-back emotion trial accuracy,

Supplemental Table 11). Additionally, to examine whether these findings were specific to emotional stimuli task performance or generalized to neural stimuli, we also examined if results remained consistent when including both 2-back emotion accuracy and 2-back neutral accuracy in models (Supplemental Table 12). Overall, most social behaviors and experiences were linked to implicit emotion regulation working memory (e.g., prosocial behavior, number of activities in the past 12 months, experiences of being bullied, reciprocal social impairments, less social problems, and experiences of discrimination), but not all social behaviors and experiences (i.e., number of close friends, overt victimization, and overt aggression were not strongly associated with task performance). Results from these analyses are also consistent with, as expected, emotional valence being more strongly associated with social experience and behavior variables than working memory demand. Specifically, significant associations were found between 2-back emotion accuracy (or average emotion accuracy) and prosocial behavior, reciprocal social impairments, and experiences of discrimination, but these associations were generally not strongly associated with 2-back neutral condition task performance (although number of activities in the past 12 months and social problems were associated with both emotion and neutral task performance, if anything, these social behaviors and experiences were numerically more strongly associated with emotional stimuli task performance).

Supplemental Table 13 displays model results when investigating whether results reported in the manuscript (i.e., between social behaviors and experience indices with emotion condition ROI activation) remain consistent when including both 2-back emotion accuracy and ROI activation as predictors. Overall, all ROI activation results remained consistent. For 2-back emotion accuracy, results indicate that lower 2-back emotion trial accuracy was associated with greater experiences of discrimination and reciprocal social impairments. 2-back emotion trial

accuracy was not strongly associated with number of close friends. These results demonstrate that more experiences of discrimination and reciprocal social impairments are linked to both lower neural activation and worse behavioral emotion regulation, whereas an increased number of close friends is only associated with higher neural activation. This provides evidence that the significant results reported in the manuscript are not solely attributable to task performance.

Lastly, associations between ROI activation and 2-back emotion trial accuracy (or average of 2-back and 0-back emotion trial accuracy) can be found in Supplemental Table 14. Overall, almost every ROI that was associated with significant findings in the manuscript also showed significant associations with both higher 2-back and average emotion trial task accuracy (except for the insula, which only showed trend-level associations with both indices of emotion task accuracy; further, left MTG showed a trend-level association with 2-back emotion accuracy). These results demonstrate that better EN-back task performance, indexing implicit emotion regulation-related working memory, is associated with greater activation in regions associated with social behaviors and experiences. Thus, overall, task performance was related to both ROI activation as well as social behaviors and experiences associated with significant findings in the manuscript, although there was evidence that the findings reported in the manuscript remain even when accounting for task performance.

Supplemental Table 1

Correlations between Each Social Behavior and Experience Measure

Measure	Prosocial Behavior (n=8971)	Number of Activities in the Past 12 Months (n=8986)	Number of Close Friends (n=7167)	Experience of Being Bullied (n=8982)	Overt Aggression (n=4832)	Overt Victimization (n=4832)	Reciprocal Social Impairments (n=8505)	Social Problems (n=8980)	Experiences of Discrimination (n=8297)
Positive Social Behavior and Experience Indices									
Prosocial Behavior (n=8971)	1								
Number of Activities in the Past 12 Months (n=8986)	0.039**	1							
Number of Close Friends (n=7167)	0.022*	0.020	1						
Negative Social Behavior and Experience Indices									
Experience of Being Bullied (n=8982)	0.059**	0.034**	-0.004	1					
Overt Aggression (n=4832)	-0.099**	-0.074**	0.063**	-0.063**	1				
Overt Victimization (n=4832)	-0.058**	-0.050**	0.035*	-0.117**	0.497**	1			
Reciprocal Social Impairments (n=8505)	-0.258**	-0.093**	-0.021	-0.228**	0.128**	0.156**	1		
Social Problems (n=8980)	-0.225**	-0.100**	0.011	-0.375**	0.099**	0.142**	0.527**	1	
Experiences of Discrimination (n=8297)	-0.029**	-.0100**	0.053**	-0.111**	0.138**	0.203**	0.137**	0.152**	1

Supplemental Table 9

Emotion, Neutral, and Overall Accuracies for 0-back and 2-back Conditions

Valence	0-back		2-back	
	Mean	SD	Mean	SD
Emotion	0.827	0.159	0.765	0.15
Neutral	0.834	0.163	0.768	0.15
Overall	0.830	0.160	0.766	0.15

Abbreviations: SD=standard deviation

Supplemental Table 10

Main Effects and Interaction for N-back Level (2-back versus 0-back) and Stimuli Type (Emotion versus Neutral) for EN-back Task Accuracy

Main Effects	Statistics			
	Std. Beta	SE	T-statistic	P value
2-back	-0.214	0.001	-45.921	<0.001***
Emotion	-0.022	0.001	-5.753	<0.001***
Interaction	0.014	0.002	2.567	0.010*

Abbreviations: Std. Beta=standardized beta; SE=standard error

Significance codes: *=<0.05; **=<0.01; ***=<0.001

Supplemental Table 11

Associations between 2-back Emotion Accuracy or 2-back and 0-back Overall Emotion Accuracy and Social Behavior and Experience Indices[a]

Index	2-back Emotion Accuracy					2-back and 0-back Overall Emotion Accuracy				
	Std. Beta	SE	T-statistic	P value	FDR corrected P value	Std. Beta	SE	T-statistic	P value	FDR corrected P value
Positive Social Behavior and Experience Indices										
Prosocial Behavior	0.028	0.030	2.592	0.01**	0.014*	0.032	0.033	2.991	0.003**	0.004**
Number of Activities in the Past 12 Months	0.071	0.142	7.453	<0.001***	<0.001***	0.076	0.157	7.924	<0.001***	<0.001***
Number of Close Friends	0.004	0.470	0.339	0.73	0.73	-0.002	0.519	-0.168	0.87	0.87
Negative Social Behavior and Experience Indices										
Experience of Being Bullied	0.056	0.028	5.208	<0.001***	<0.001***	0.067	0.031	6.177	<0.001***	<0.001***
Overt Aggression	-0.018	0.076	-1.272	0.20	0.26	-0.016	0.084	-1.115	0.26	0.34
Overt Victimization	-0.007	0.129	-0.504	0.61	0.69	-0.008	0.143	-0.541	0.59	0.66
Reciprocal Social Impairments	-0.101	0.290	-9.287	<0.001***	<0.001***	-0.109	0.321	-9.869	<0.001***	<0.001***
Social Problems	-0.115	0.156	-11.067	<0.001***	<0.001***	-0.133	0.173	-12.741	<0.001***	<0.001***
Experiences of Discrimination	-0.093	0.025	-8.613	<0.001***	<0.001***	-0.094	0.027	-8.571	<0.001***	<0.001***

Abbreviations: Std. Beta=standard beta; SE=standard error; FDR=false discovery rate

Significance codes: *=<0.05; **=<0.01; ***=<0.001

[a]Note, FDR-corrections were performed by hemisphere (i.e., 18 FDR-corrections for left ROIs; 18 FDR-corrections for right ROIs.)

Supplemental Table 12

Associations between Social Behavior and Experiences Indices and 2-back EN-back Task Accuracy by Emotion Condition (Emotion versus Neutral)

Index	2-back Emotion Accuracy				2-back Neutral Accuracy			
	Std. Beta	SE	T-statistic	P value	Std. Beta	SE	T-statistic	P value
Positive Social Behavior and Experience Indices								
Prosocial Behavior	0.032	0.042	2.189	0.029*	-0.007	0.036	-0.450	0.65
Number of Activities in the Past 12 Months	0.050	0.192	3.921	<0.001***	0.030	0.169	2.353	0.019*
Number of Close Friends	0.004	0.650	0.276	0.78	-0.001	0.57	-0.045	0.96
Negative Social Behavior and Experience Indices								
Experience of Being Bullied	0.044	0.038	2.954	0.003**	0.017	0.034	1.187	0.24
Overt Aggression	-0.011	0.104	-0.561	0.58	-0.011	0.09	-0.547	0.58
Overt Victimization	-0.010	0.176	-0.517	0.61	0.004	0.152	0.217	0.83
Reciprocal Social Impairments	-0.091	0.400	-6.089	<0.001***	-0.014	0.35	-0.950	0.34
Social Problems	-0.086	0.215	-6.034	<0.001***	-0.042	0.189	-2.953	0.003**
Experiences of Discrimination	-0.074	0.034	-4.929	<0.001***	-0.028	0.03	-1.906	0.06

Abbreviations: Std. Beta=standard beta; SE=standard error

Significance codes: *=<0.05; **=<0.01; ***=<0.001

Supplemental Table 13

Associations between Social Behavior and Experience Indices, MRI ROI, and 2-Back Emotion Condition EN-back Accuracy

Index	MRI					2-back Emotion Accuracy			
	ROI	Std. Beta	SE	T-statistic	P value	Std. Beta	SE	T-statistic	P value
Number of Close Friends	Left Fusiform Gyrus	0.029	0.156	2.700	0.007**	0.005	0.501	0.446	0.66
Number of Close Friends	Left Insula	0.035	0.234	3.302	0.001***	0.009	0.499	0.800	0.42
Number of Close Friends	Left Inferior Parietal	0.028	0.214	2.620	0.009**	0.007	0.499	0.594	0.55
Number of Close Friends	Left Superior Temporal Gyrus	0.028	0.250	2.654	0.008**	0.008	0.499	0.667	0.50
Number of Close Friends	Left Temporoparietal Junction	0.031	0.252	2.867	0.004**	0.007	0.499	0.609	0.54
Experiences of Discrimination	Left Middle Temporal Gyrus	-0.033	0.009	-3.124	0.002**	-0.090	0.026	-7.891	<0.001***
Reciprocal Social Impairments	Left Fusiform Gyrus	-0.027	0.097	-2.494	0.012*	-0.082	0.312	-7.148	<0.001***

Abbreviations: Std. Beta=standard beta; SE=standard error; ROI=region of interest

Significance codes: *=<0.05; **=<0.01; ***=<0.001