Supplemental Materials
(Luttrell, Stillman, Hasinski, & Cunningham, 2016)

Supplemental Results: Accounting for the Ambivalence-Certainty Correlation

It remains possible that most of the meaningful variance within our data is captured by the correlation between certainty and ambivalence. In other words, it is possible that certainty and ambivalence are not actually independent in the mind, and that our results simply reflect random chance in which variance was accounted for by each measure. This is a problem especially if our measures are unreliable. While we do not have reliability estimates within our own data, past research consistently finds correlations between ambivalence and certainty similar to those we find in our data (e.g., Petrocelli, Tormala, & Rucker, 2007; Smith, Fabrigar, Macdougall, & Wiesenthal, 2008; Wright, Cullum, & Schwab, 2007).

To further demonstrate that our results are not an artifact of the high correlation between our two measures, we conducted three follow-up analyses treating individual-level ambivalence-uncertainty correlations as covariates or as moderators of the reported results. First, to test whether our results are merely a function of the correlation between ambivalence and uncertainty, we re-ran our model including each subject's ambivalence-certainty correlation as a covariate. The results of this model look nearly identical to the results reported in the text, suggesting that our reported results hold when controlling for the degree of individuals' ambivalence-uncertainty correlations.

We next conducted two analyses predicting activation in the ROIs identified as preferentially activating to certainty, ambivalence, or both, and testing whether these patterns of activation depended on individuals' ambivalence-uncertainty correlations. First, we performed a median split on our dataset, analyzing only those participants who were below the median correlation for certainty and ambivalence (maximum $r > -.7$, new average $r = -.47$). If our results are a byproduct of high correlation amongst our measures, then we would not expect our results to hold in participants for which those measures are less strongly correlated. Inconsistent with this, however, all regions still significantly activate preferentially to either certainty or ambivalence. Our results further remain unchanged when we analyze only participants with certainty-ambivalence correlations above -.6 (N = 8, new average r = -.43) and above -.58 (N = 6, new average r = -.38). Together, this suggests that our results are robust to the strength of the ambivalence-certainty correlation.

Finally, we investigated whether the strength of individuals' ambivalence-uncertainty correlations interacted with our predictors to predict activation. If our results are driven by partialling out substantial shared variance between ambivalence and uncertainty, we would expect more pronounced results for those participants for which this correlation is strong. To test this, we conducted two sets of analyses – one testing whether an interaction exists between our predictors and whether they are above or below the median correlation (i.e., dichotomous moderator), and one testing whether an interaction exists between our predictors and the strength of the correlation itself (i.e., continuous moderator).

Consistent with our predictions, we find no significant interactions using either the median split or the correlation strength as a moderator. The one exception to this was a single ROI (the Posterior Cingulate Cortex) had a significant interaction between ambivalence and the correlation. Inspection of this, however, revealed that the relationship between ambivalence and ROI activation was actually stronger when the correlation between certainty and ambivalence was weaker. Indeed, as can be seen in Table S1 and Figures S1-S7, although the interactions are generally nonsignificant, the patterns are such that for every ROI, our effects become more pronounced as the correlation between certainty and ambivalence becomes weaker (not stronger).

Finally, inspection of the data revealed one participant who had an abnormally low correlation between ambivalence and certainty (r = -.03). To ensure our results were not driven by this outlier, we reran our analyses dropping this participant. Dropping this participant did not alter the significance of any results. Altogether, these analyses provide converging evidence that our effect is not driven by the strong correlation between ambivalence and certainty.

	ACC		PCC		dmPFC		Anterior Medial Wall	
	Ambivalence	Certainty	Ambivalence	Certainty	Ambivalence	Certainty	Ambivalence	Certainty
r = -.4	37.16***	3.93	54.63***	20.87†	51.23***	11.09	35.56***	2.175
r = -.6	30.78***	3.79	32.35***	10.27	38.06***	7.34	29.73***	-0.1
r = -.8	24.40*	3.64	10.07	-0.33	24.88*	3.71	23.90**	-2.38

Table S1. Estimated beta-weights of ambivalence and certainty at different levels of the ambivalence-certainty correlation (*r*) for the ROIs identified as being uniquely activated to ambivalence. ***: $p < .001$; **: $p < .01$; *: $p < .05$; †: $p < .1$.

	PCC/Precuneus		PCC/Precuneus	
	Ambivalence	Certainty	Ambivalence	Certainty
r = -.4	10.53	39.96**	8.3	31.77**
r = -.6	9.48	35.03***	8.61	29.97***
r = -.8	8.44	30.09*	8.92	28.18*

Table S2. Estimated beta-weights of ambivalence and certainty at different levels of the ambivalence-certainty correlation (*r*) for the ROIs identified as being uniquely activated to certainty. ***: $p < .001$; **: $p < .01$; *: $p < .05$

	dlPFC	
	Ambivalence	Certainty
r = -.4	30.57**	27.54**
r = -.6	27.08***	25.92***
r = -.8	23.60*	24.31*

Table S3. Estimated beta-weights of ambivalence and certainty at different levels of the ambivalence-certainty correlation (*r*) for the ROI identified as activating to both ambivalence and certainty. ***: $p < .001$; **: $p < .01$; *: $p < .05$

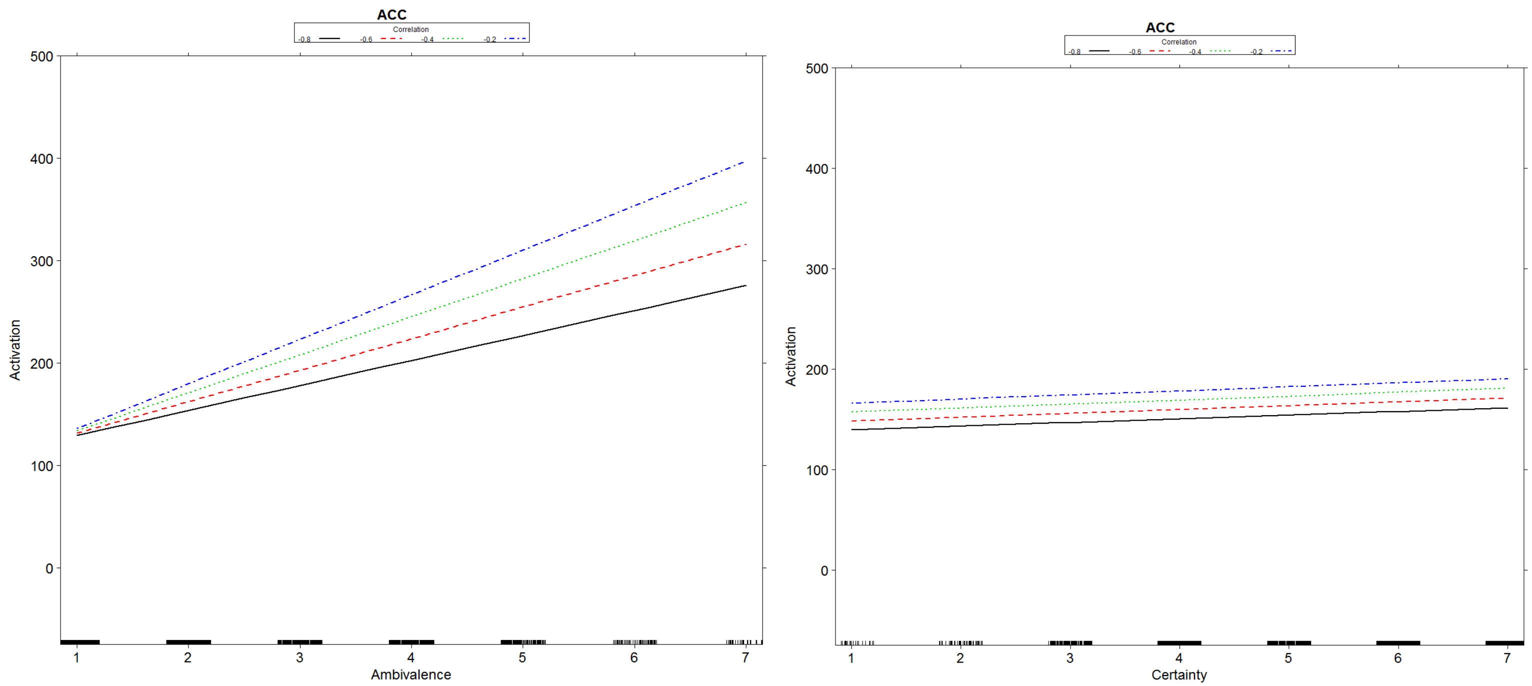

Figure S1. Activation for ACC in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).

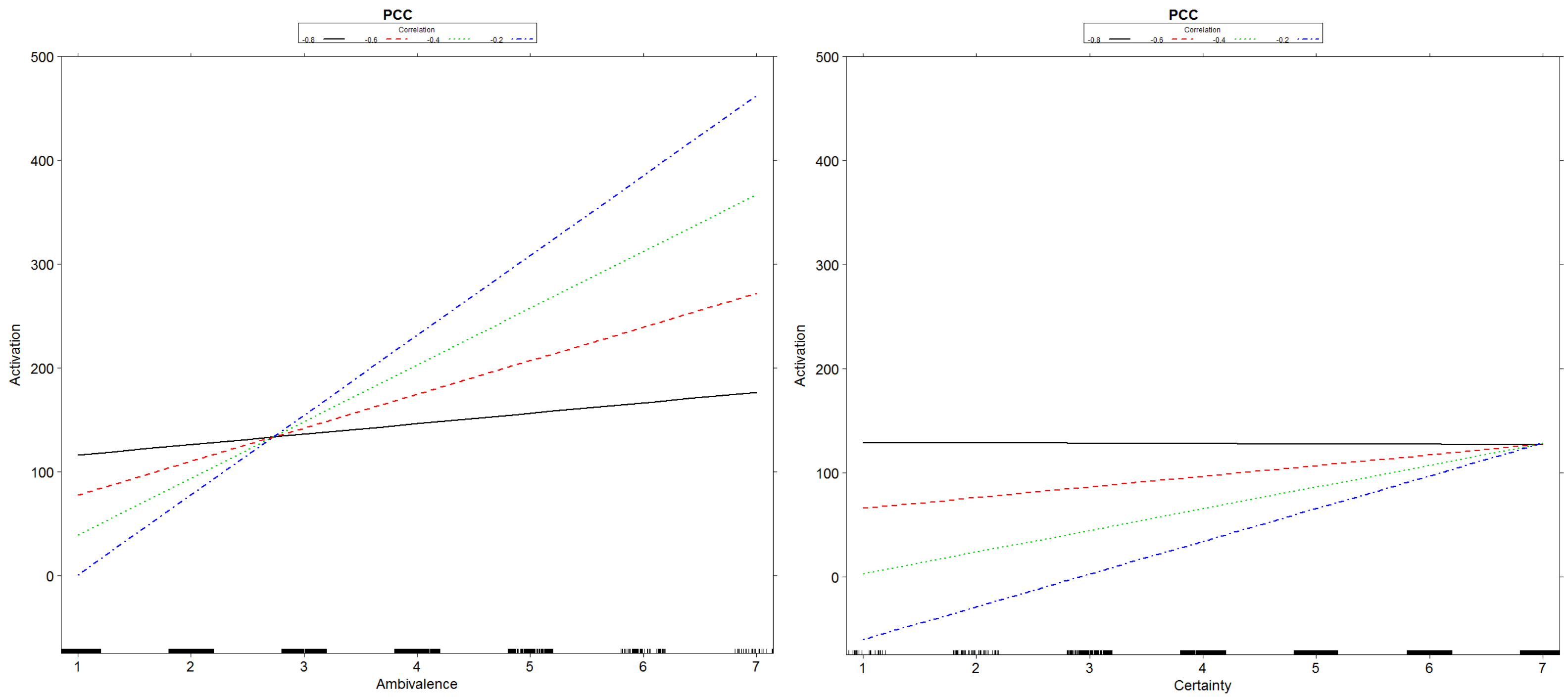

Figure S2. Activation for the PCC ROI (*x* = -6, *y* = -48, *z* = 26) in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).

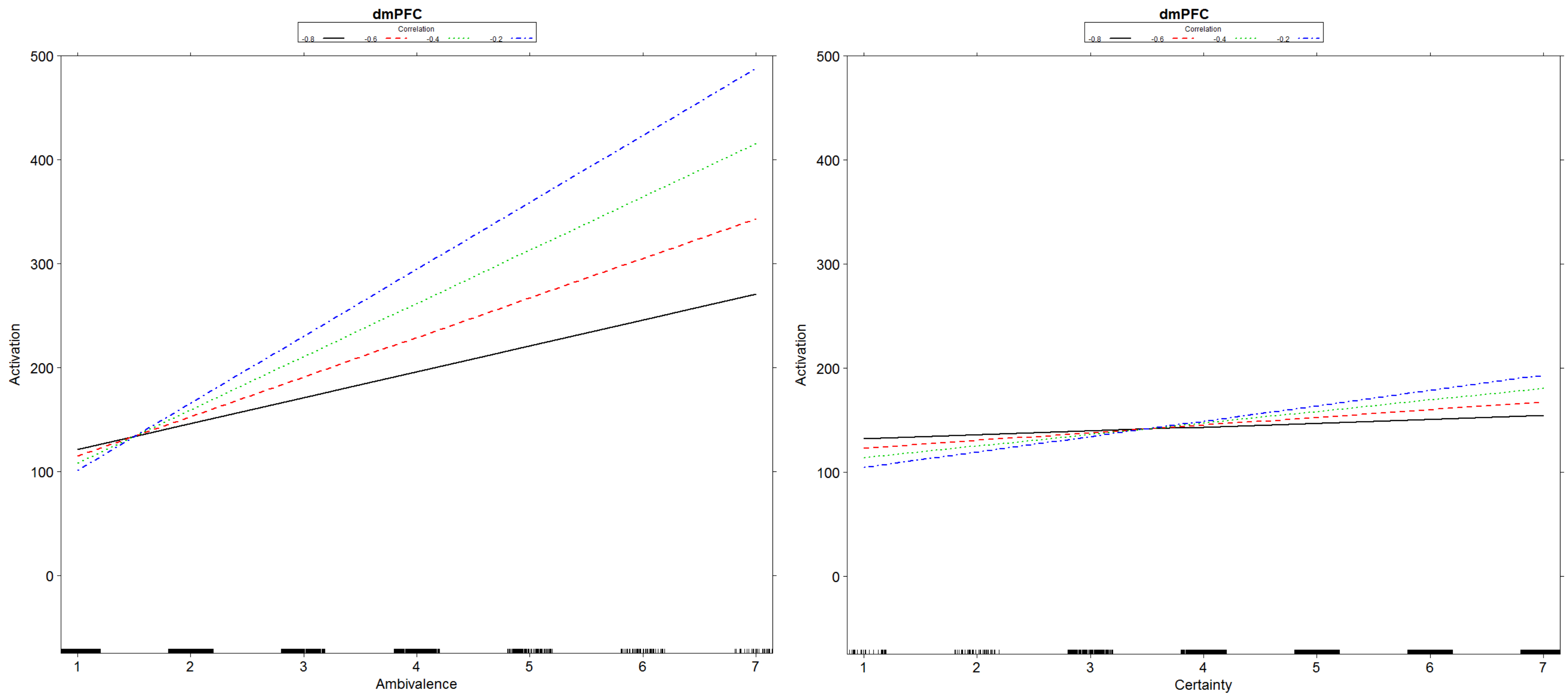

Figure S3. Activation for the dmPFC ROI (*x* = -2, *y* = 56, *z* = 20) in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).

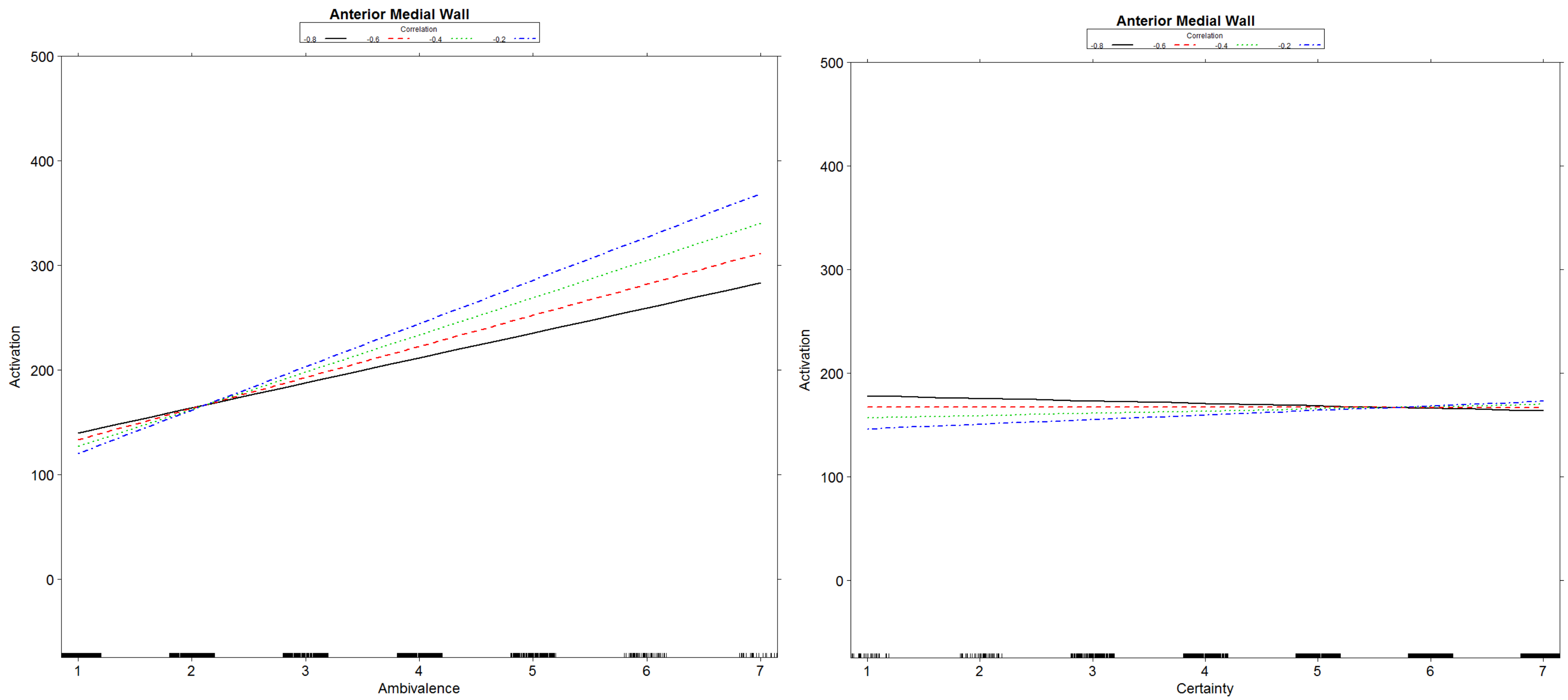

Figure S4. Activation for the anterior medial wall ROI (x = 10, y = 14, z = 66) in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).

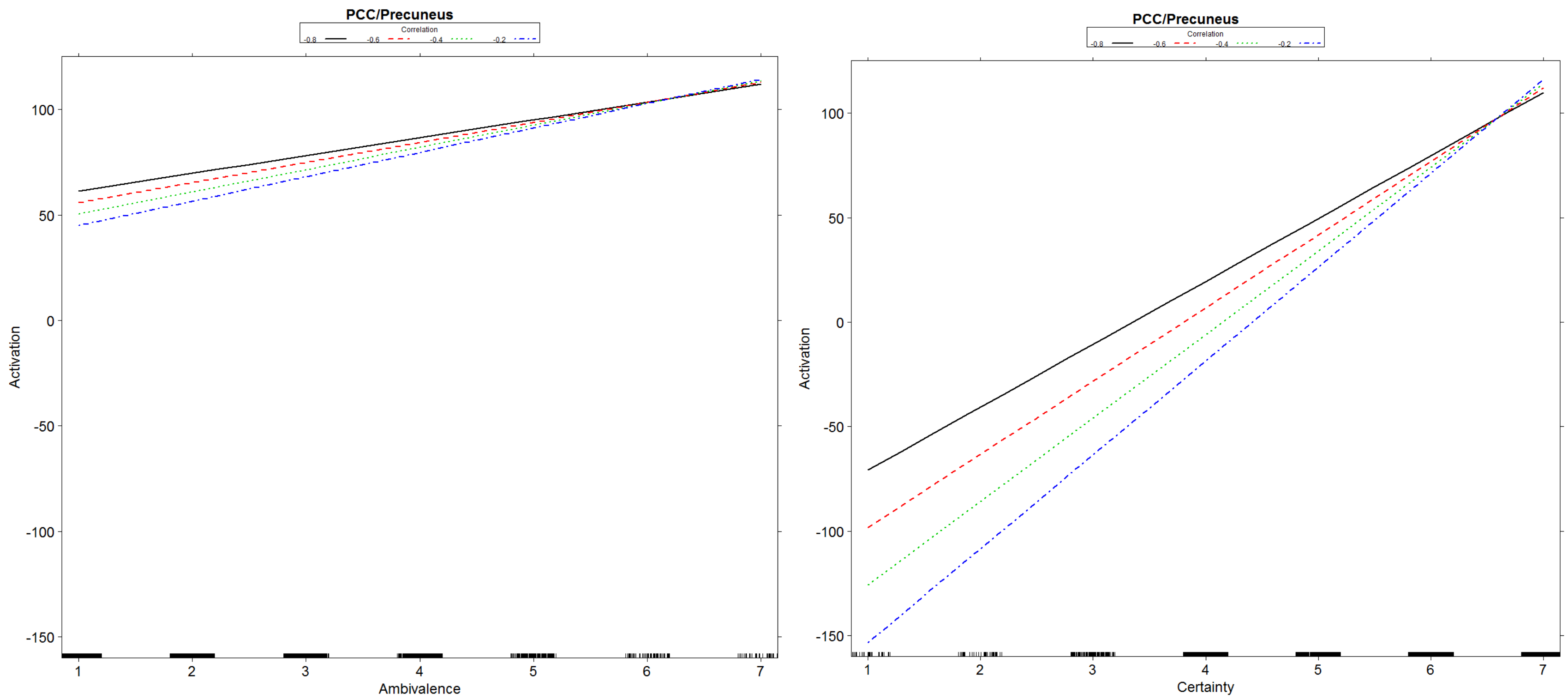

Figure S5. Activation for the more dorsal PCC/Precuneus ROI (x = 4, y = -32, z = 48) in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).

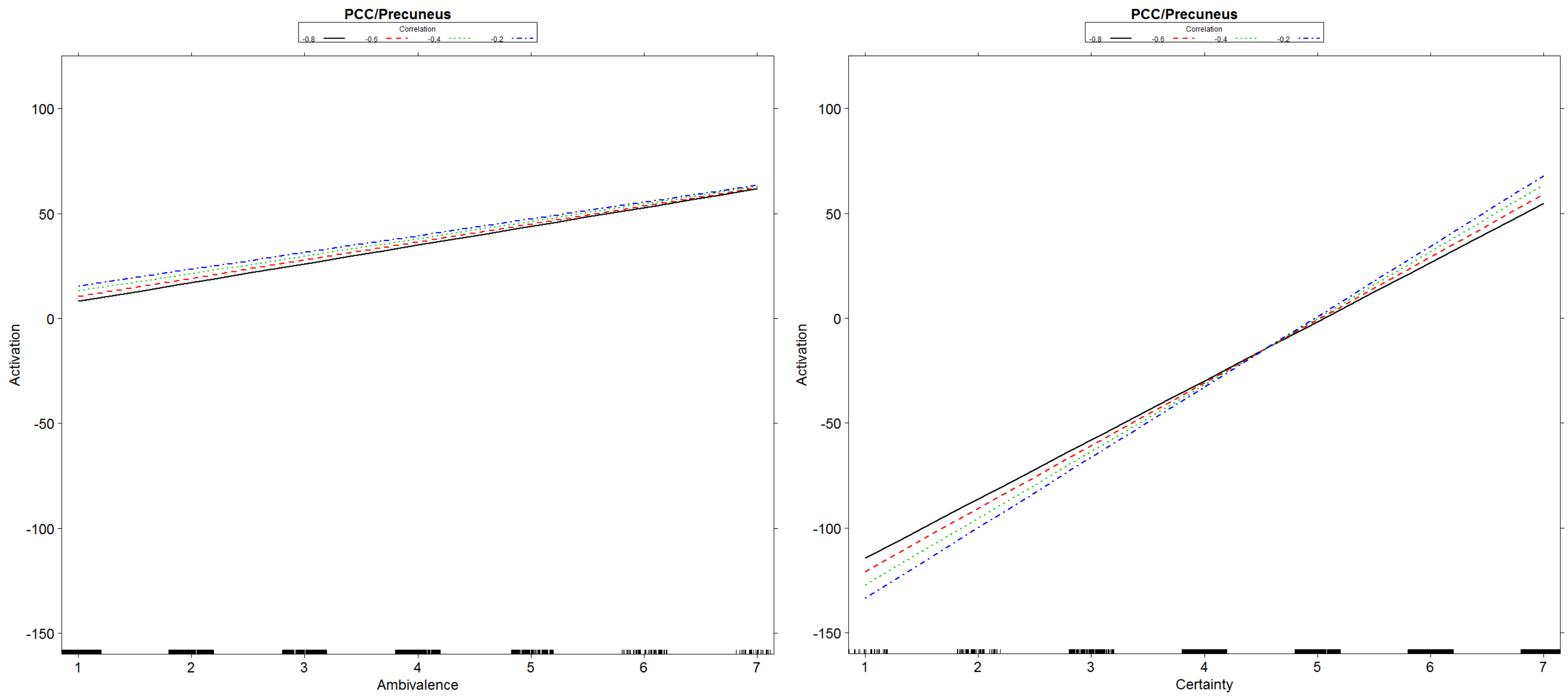

Figure S6. Activation for the more ventral PCC/Precuneus ROI (*x* = 6, *y* = -54, *z* = 58) in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).

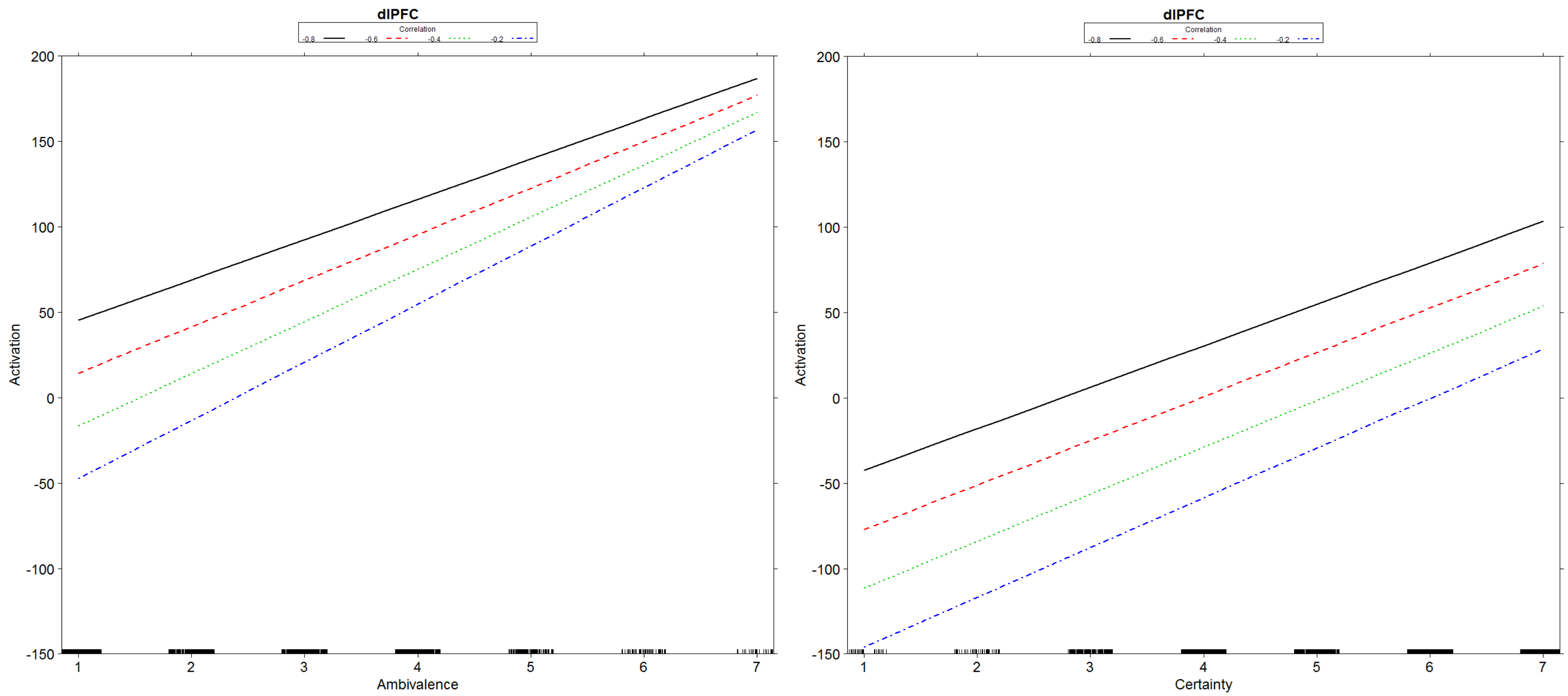

Figure S7. Activation for the dlPFC ROI (x = 48, y = 26, z = 24) in response to ambivalence (left) and certainty (right). Different lines represent different levels of the ambivalence-certainty correlation: -.2 (blue), -.4 (green), -.6 (red), and -.8 (black).