

**Supplementary Materials for  
“Highly accurate prediction of emotions surrounding the attacks of  
September 11, 2001 over 1-, 2-, and 7-year prediction intervals”**

**1. Forecasting accuracy is comparable across attrition-defined participant groups**

The analyses we report in the main manuscript considered forecast accuracy in 202 participants who completed all 4 consecutive waves of our study (i.e., 2001, 2002, 2004, and 2011). An additional 186 participants completed only three consecutive waves (i.e., 2001, 2002, and 2004), and an additional 324 completed only two (i.e., 2001 and 2002). In order to ask if our results may have differed because of attrition-related selection bias, we repeated our analyses of absolute and relative forecasting accuracy in these groups of participants.

First we considered the group of 186 participants who completed the 2001, 2002, and 2004 (but not 2011) surveys. With respect to absolute accuracy in this group, forecasts showed equivocal evidence for underestimation over the 1-year prediction interval,  $b = -.11$ , 95%CI[-.23, .01], 2.4:1 odds in favor of the null, and over the 2-year prediction interval,  $b = -.11$ , 95%CI[-.23, .01], 2.4:1 odds in favor of the null. Forecasts showed no report type (forecasted versus actual) by emotion type (sadness, fear, anger) interaction,  $X^2 = 0.46$ , 1719:1 odds in favor of the null (i.e., forecasts and actual affect show equivalent relative levels of different emotions). Turning to relative accuracy, there was high relative accuracy in forecasting overall negative affect intensity across 1-year,  $b = .71$ , 95%CI[.59, .83] and 2-year,  $b = .68$ , 95%CI[.56, .79], prediction intervals. Similarly, there was high relative accuracy over the 1-year interval for predicting sadness degree,  $b = .46$ , 95%CI[.35, .57], fear degree,  $b = .28$ , 95%CI[.13, .42], and anger degree,  $b = .56$ , 95%CI[.44, .69]. Lastly, there was also high relative accuracy over the 2-year interval for predicting sadness degree,  $b = .31$ , 95%CI[.19, .42], fear degree,  $b = .38$ , 95%CI[.24, .52], and anger degree,  $b = .45$ , 95%CI[.30, .59].

Next we considered the group of 324 participants who completed the 2001, and 2002 (but not 2004 or 2011) surveys. With respect to absolute accuracy in this group, forecasts were largely accurate,  $b = -.03$ , 95%CI[-.13, .05], 30:1 odds in favor of the null. There was also no report type (forecasted versus actual) by emotion type (sadness, fear, anger) interaction,  $X^2 = 2.8$ , 468:1 odds in favor of the null (i.e., forecasts and actual affect show equivalent relative levels of different emotions). Turning to relative accuracy, there was high relative accuracy in forecasting negative affect intensity for this 1-year prediction interval,  $b = .73$ , 95%CI[.64, .83]. Similarly, there was high relative accuracy over the 1-year interval for predicting sadness degree,  $b = .30$ , 95%CI[.19, .41], fear degree,  $b = .34$ , 95%CI[.23, .45], and anger degree,  $b = .37$ , 95%CI[.26, .47].

Figure S1 (below) displays estimated effects  $\pm$  95%CI for analyses across the three attrition-defined participant groups. Overall, estimates derived from participants completing 2 or 3 consecutive waves are very similar to those derived from the sample of participants completing all 4 waves – confidence intervals show substantial overlap in every case. This pattern of results suggests

that there was little or no overestimation of absolute or relative affective forecast accuracy brought about by attrition-related sampling bias.

## **2. Relative accuracy is high for non-mean-centered ratings of emotion types**

The analyses we report in the main manuscript considered relative degree of different kinds of emotions (i.e., deflections from the mean of all types of negative affect), which remove person-to-person variability related to overall intensity of negative affect. We also conducted analyses of relative accuracy on the raw ratings of sadness, fear, anger, confusion, frustration, and shock, which we report here. By their nature, these effects confound relative accuracy in forecasting overall emotional intensity with relative accuracy in forecasting degrees of different types of emotions. As such, these linear relationships are stronger than those observed with the mean-centered affect ratings.

Raw (i.e., non-centered) predictions of sadness were strongly predictive of experienced sadness for 1-year,  $b=.47$ , 95%CI [.35, .59], 2-year,  $b=.61$ , 95%CI [.49, .72], and 7-year prediction intervals,  $b=.54$ , 95%CI [.42,.67]. Similarly, raw predictions of fear were strongly predictive of experienced fear for 1-year,  $b=.49$ , 95%CI [.38, .60], 2-year,  $b=.61$ , 95%CI [.49, .73], and 7-year prediction intervals,  $b=.53$ , 95%CI [.41,.65]. Finally, raw predictions of anger were also strongly predictive of experienced anger for 1-year  $b=.63$ , 95%CI [.52, .74], 2-year,  $b=.61$ , 95%CI [.51, .71], and 7-year prediction intervals,  $b=.58$ , 95%CI [.46, .69].

Of secondary interest, raw predictions of confusion were strongly predictive of experienced confusion for 1-year,  $b=.48$ , 95%CI [.36, .60], 2-year,  $b=.58$ , 95%CI [.47, .70], and 7-year prediction intervals,  $b=.46$ , 95%CI [.34, .59]. Raw predictions of frustration were strongly predictive of experienced frustration for 1-year,  $b=.47$ , 95%CI [.35, .60], 2-year,  $b=.49$ , 95%CI [.37, .62], and 7-year prediction intervals,  $b=.55$ , 95%CI [.42,.68]. Finally, raw predictions of shock were strongly predictive of experienced shock for 1-year  $b=.49$ , 95%CI [.38, .60], 2-year,  $b=.55$ , 95%CI [.43, .67], and 7-year prediction intervals,  $b=.61$ , 95%CI [.48, .74].

## **3. Forecast accuracy is not strongly associated with the extremeness of initial negative affect ratings**

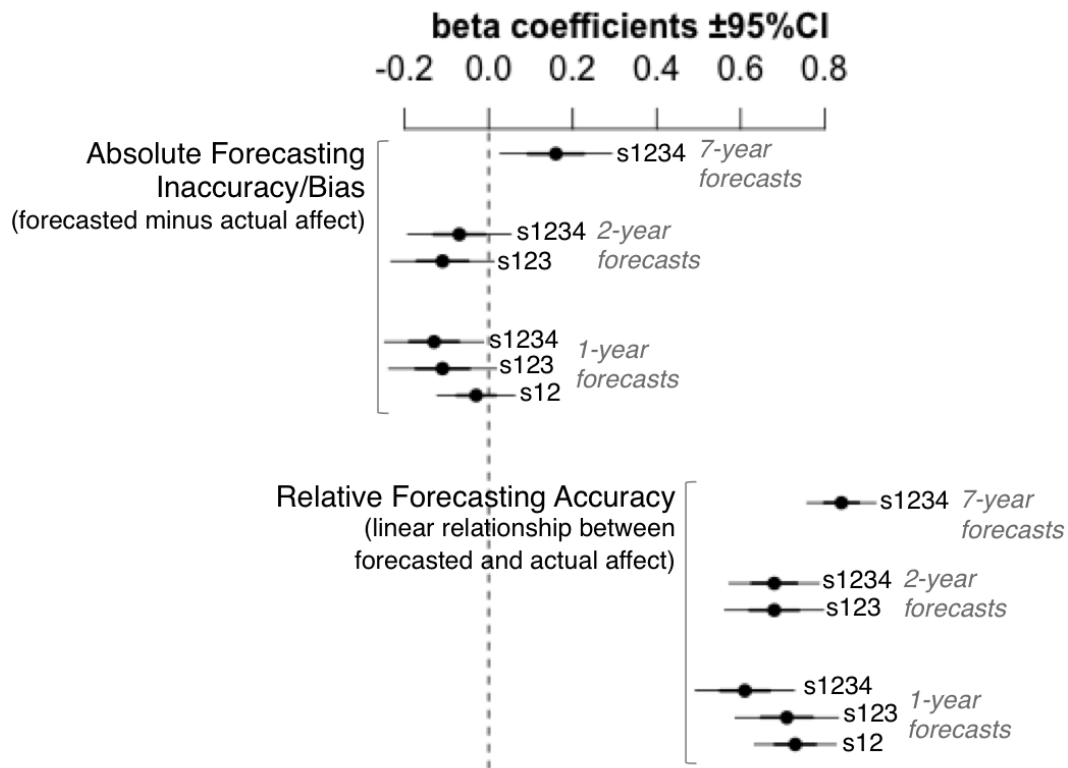
We conducted exploratory follow-up analyses to ask whether forecast accuracy was related to the extremeness of initial negative affect ratings (i.e., absolute distance from 3 on the 1-5 scale). We found that initial extremeness was not strongly related to absolute accuracy in emotional prediction (i.e., forecasted minus actual affect) at any time point, including 1-year predictions,  $b=-.08$ , 95%CI [-.31, .14], 2-year predictions,  $b=.08$ , 95%CI [-.11, .28], and 7-year predictions,  $b=.03$ , 95%CI [-.19, .25]. In addition, the linear relationships representing relative accuracy held when adjusting for extremeness of initial affect ratings for 1-year predictions,  $b=.52$ , 95%CI [.40, .64], 2-year predictions,  $b=.65$ , 95%CI [.53, .76], and 7-year predictions,  $b=.73$ , 95%CI [.60, .86].

#### **4. Forecasting accuracy is not strongly related to having been living in NYC in 2001 or having experienced personal loss/inconvenience as a result of the attacks**

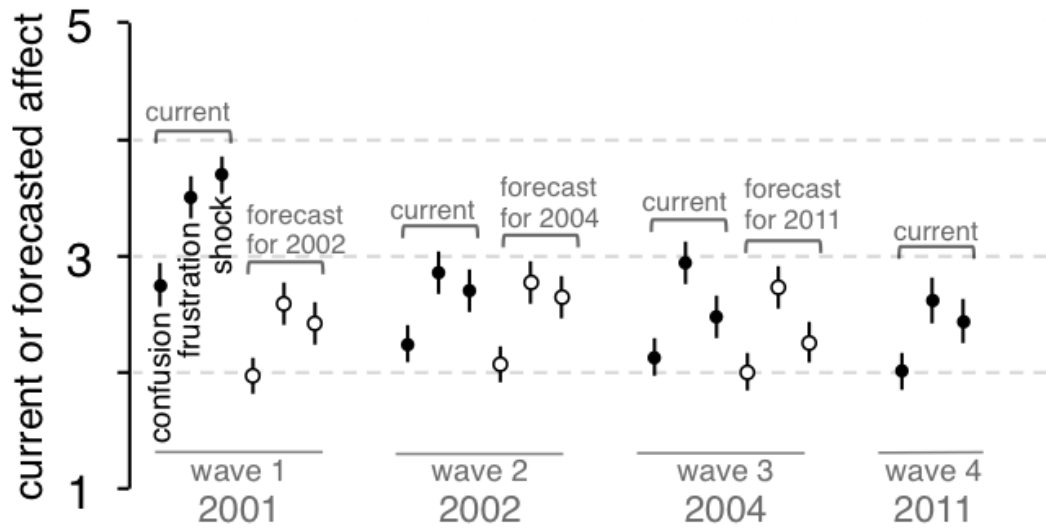
We conducted exploratory follow-up analyses to ask if forecast accuracy was related to having been living in NYC on September 11 or having experienced personal loss/inconvenience as a result of the attacks. Out of 202 participants, 78 participants were living in NYC, and 124 were living in another US city (mostly New Haven, St Louis, and DC). Also, 72 of the 202 reported having experienced personal loss or inconvenience (e.g. financial loss, damage to home, injury to self or family member, lack of food, etc.) as a result of the September 11 attacks.

In general, having been a resident of NYC during Sept 11, 2001, is associated with more intense emotional responding. For example, it is predictive of greater Sept 2001 sadness,  $b = .31$ , 95%CI[.03, .59], and overall negative affect intensity,  $b = .23$ , 95%CI[.00, .46]. It is also directionally predictive of greater negative affect in 2002,  $b = .22$ , 95%CI[-.04, .47], in 2004,  $b = .17$ , 95%CI[-.08, .41], and in 2011,  $b = .26$ , 95%CI[-.03, .54]. Similarly, reporting having experienced a personal loss or inconvenience is associated with more intense negative affect in 2001,  $b = .27$ , 95%CI[.04, .50]. However, it is not strongly associated with more intense negative affect in 2002,  $b = .06$ , 95%CI[-.22, .34], 2004,  $b = .08$ , 95%CI[-.17, .33] or 2011,  $b = .06$ , 95%CI[-.11, .47].

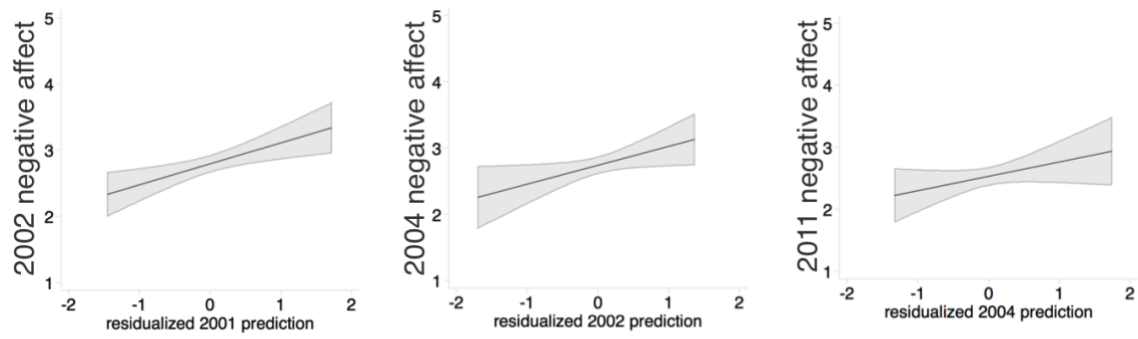
On the other hand, the data do not suggest that having been a resident of NYC during September 11, 2001 or having experienced a personal loss/inconvenience is related to accuracy in forecasting emotion. NYC residents do not show more inaccurate absolute forecasts (i.e., forecasted affect minus actual affect) for 1-year predictions,  $b = -.08$ , 95%CI[-.31, .15], 2-year predictions,  $b = -.07$ , 95%CI[-.27, .13], or 7-year predictions,  $b = -.13$ , 95%CI[-.35, .09]. Moreover, the linear relationships reflecting relative accuracy hold when adjusting for having been a resident of NYC in 2001, for 1-year predictions,  $b = .60$ , 95%CI [.49, .72], 2-year predictions,  $b = .67$ , 95%CI [.57, .78], and 7-year predictions,  $b = .74$ , 95%CI [.62, .87]. Similarly, those experiencing loss do not show more inaccurate absolute forecasting,  $b = .04$ , 95%CI[-.10, .17], and the relationships reflecting relative accuracy hold when controlling for loss/inconvenience for 1-year predictions,  $b = .68$ , 95%CI [.56, .80], 2-year predictions,  $b = .68$ , 95%CI [.57, .78], and 7-year predictions,  $b = .75$ , 95%CI [.63, .88].



**Supplementary Figure S1** Estimated effects with standard errors and 95%CI across the three attrition-defined participant groups, including participants completing all 4 survey waves (s1234), participants completing 3 consecutive survey waves (s123), and participants completing 2 consecutive survey waves (s12). Overall, absolute forecasting bias is very low, and relative forecasting accuracy is very high. Estimates derived from participants completing 2 or 3 consecutive waves are similar to those derived from the sample of participants completing all 4 waves (intervals show substantial overlap).



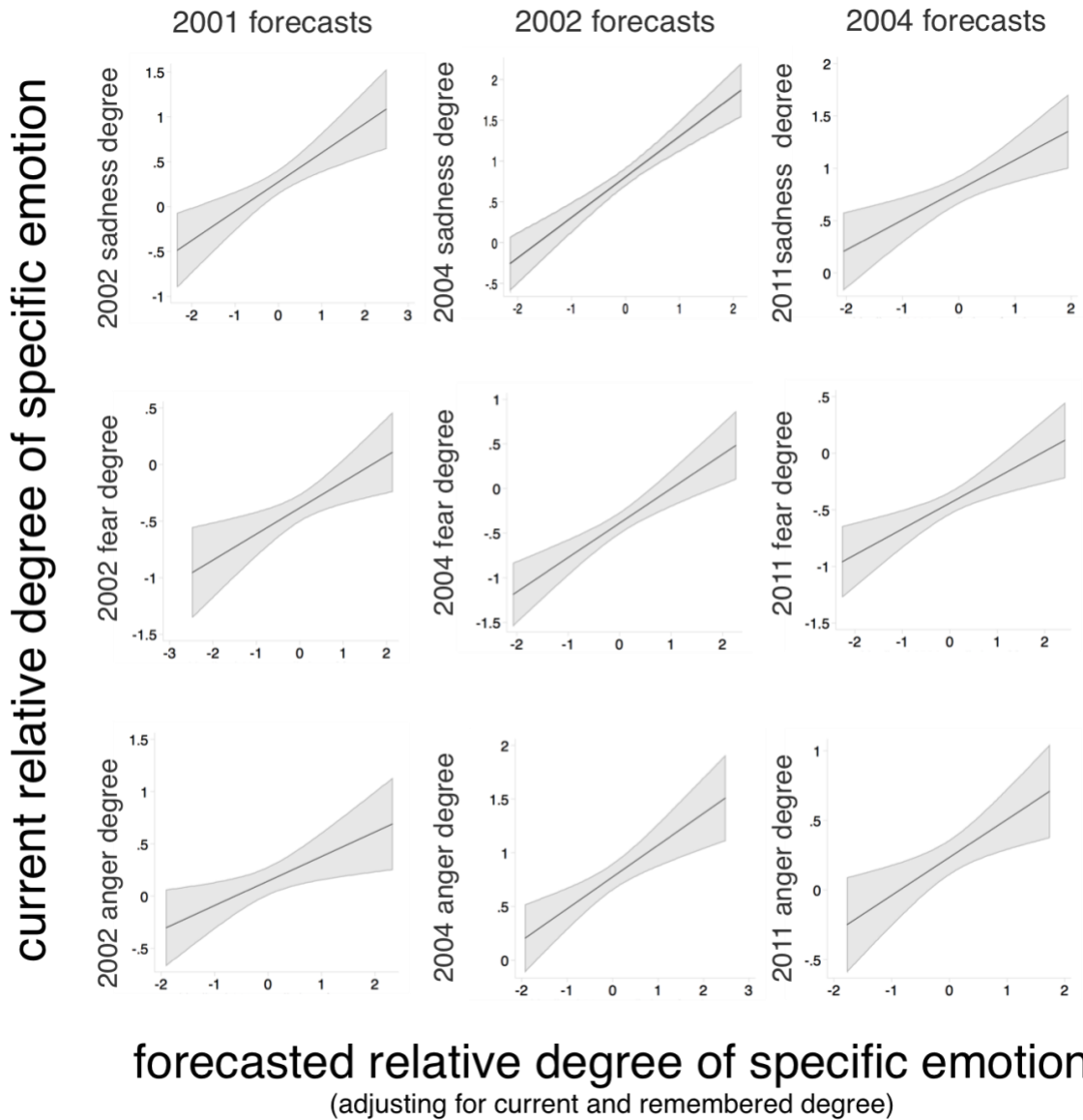
**Supplementary Figure S2** Current and predicted intensity of confusion, frustration, and shock in 2001, 2002, 2004, and 2011. These negative emotions decay slowly over time, and forecasts are largely accurate at the level of participants as a group. Group means with 95%CI.



### forecasted negative affect intensity

(adjusting for current and remembered intensity)

**Supplementary Figure S3** Relationship between the overall intensity of negative affect reported in response to the attacks in 2002, 2004, and 2011 and predictions of negative affect intensity made 1-, 2-, and 7-years earlier, adjusted for the overall intensity of current and remembered negative affect.



**Supplementary Figure S4** Relationships between the relative degree of specific emotions reported in response to the attacks in 2002, 2004, and 2011 (i.e. reports of particular categories centered on the mean of all reported negative emotion) and predictions of relative degree made 1-,2-, and 7-years earlier (i.e. predictions mean-centered in the same manner), adjusted for current and remembered relative degree of emotion.

