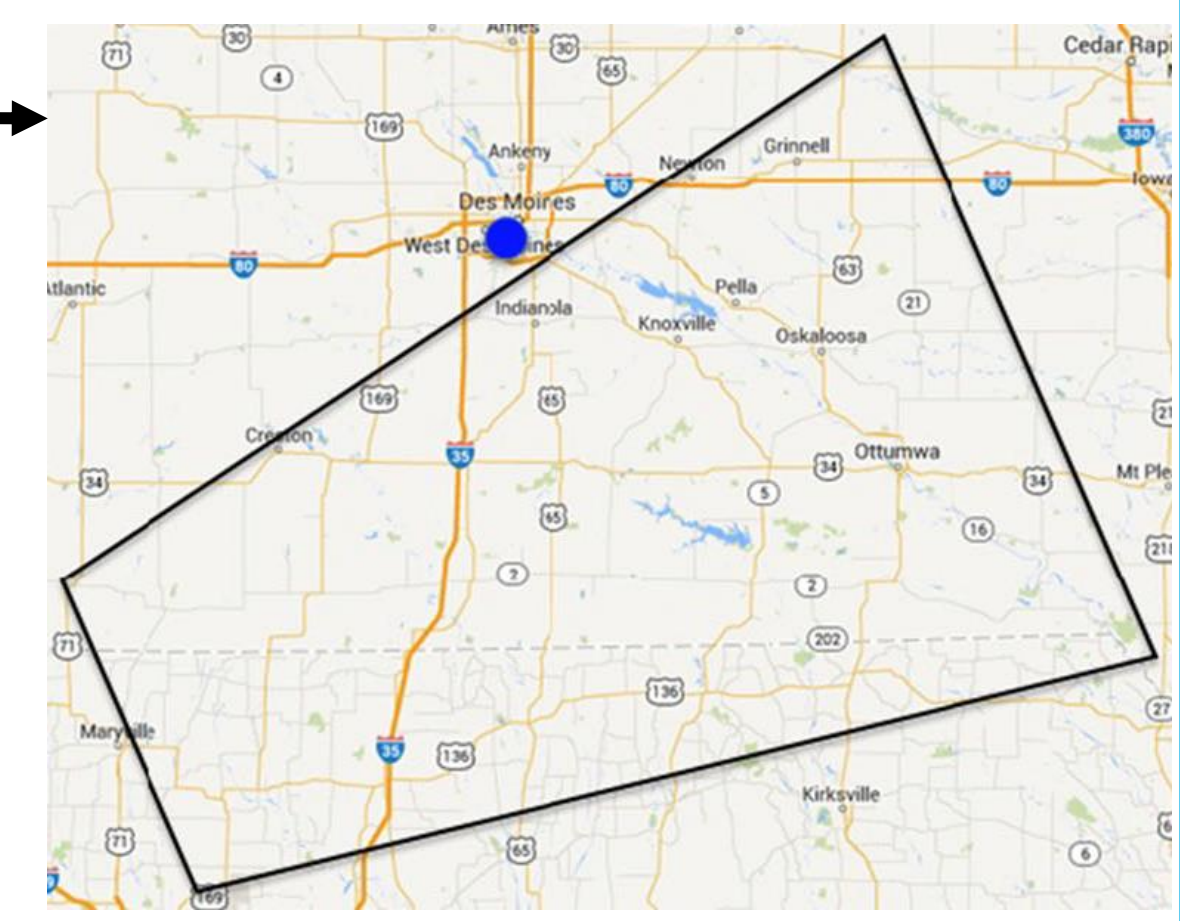




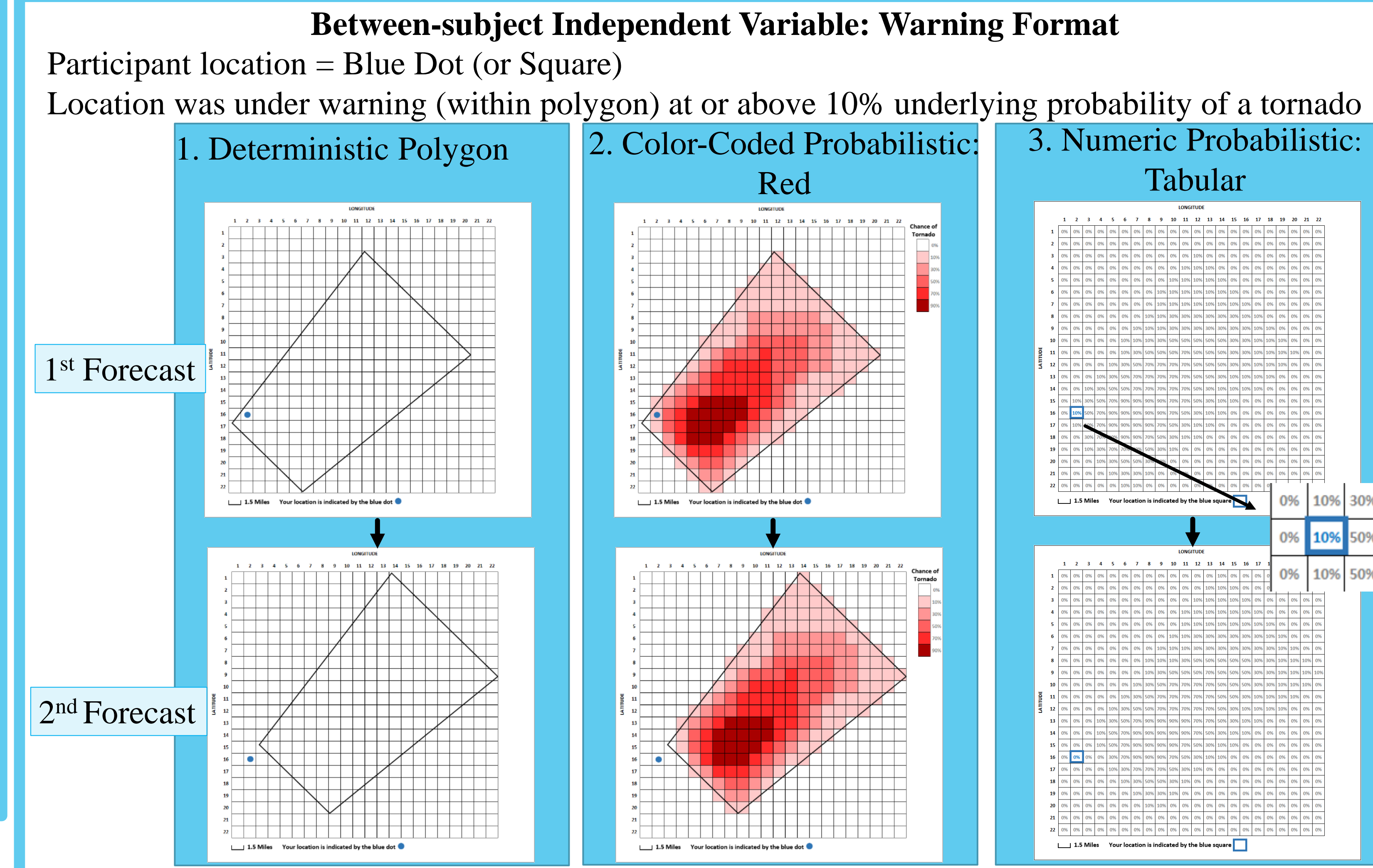
Background and Research Goals

- Current tornado warning polygon is deterministic, implying a tornado *will* occur inside.
- Research suggests that probabilistic forecasts improve understanding of tornado likelihood (Qin et al., 2023).
- However, tornado forecasts are evolving: Consecutive forecasts are issued for same event.
- Will advantages for probabilistic forecasts generalize to multiple forecast scenarios?
- We recruited participants from the Southeastern US where the risk of tornadoes is heightened to find out.

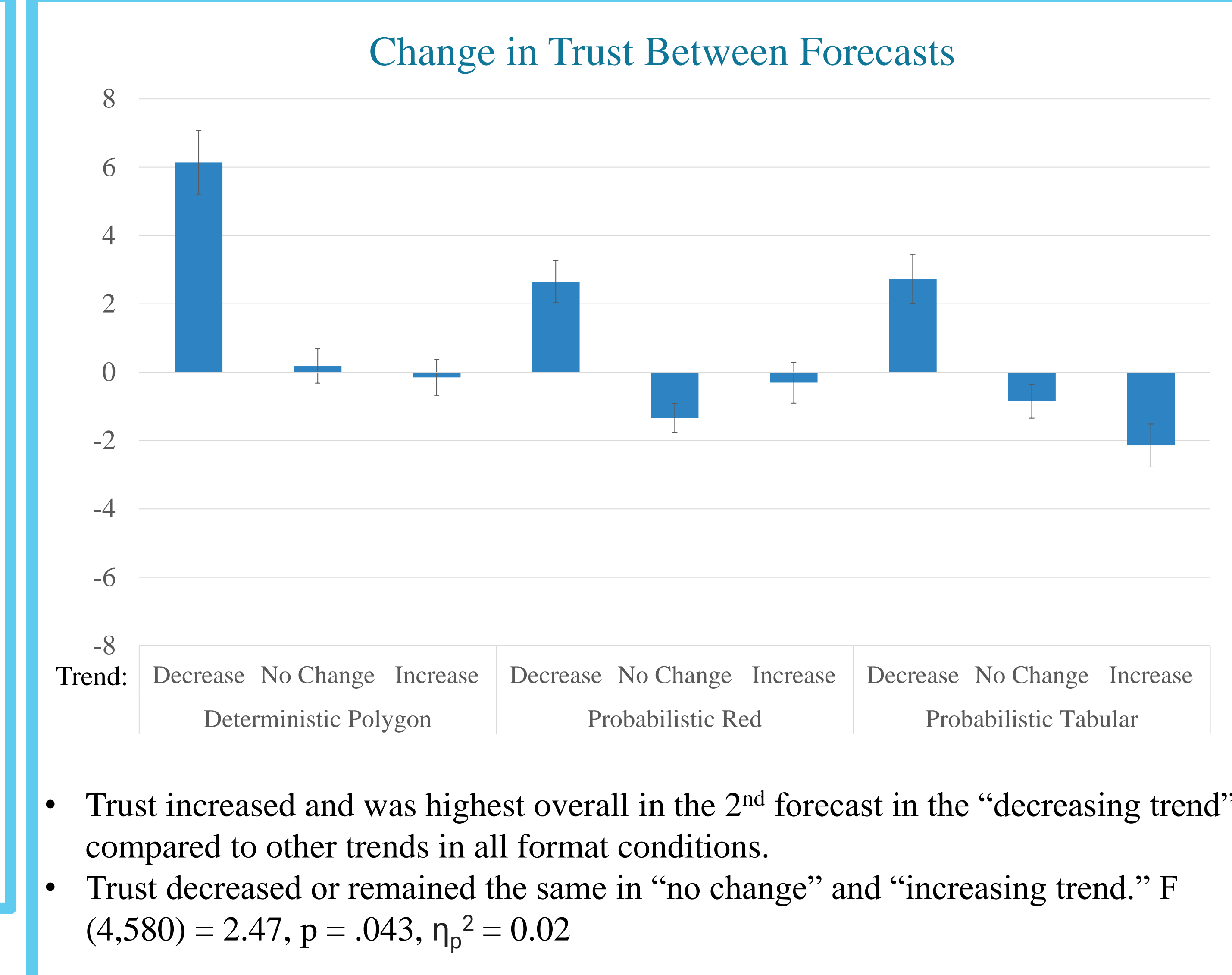
Tornado Warning Polygon



Experimental Procedure Continued



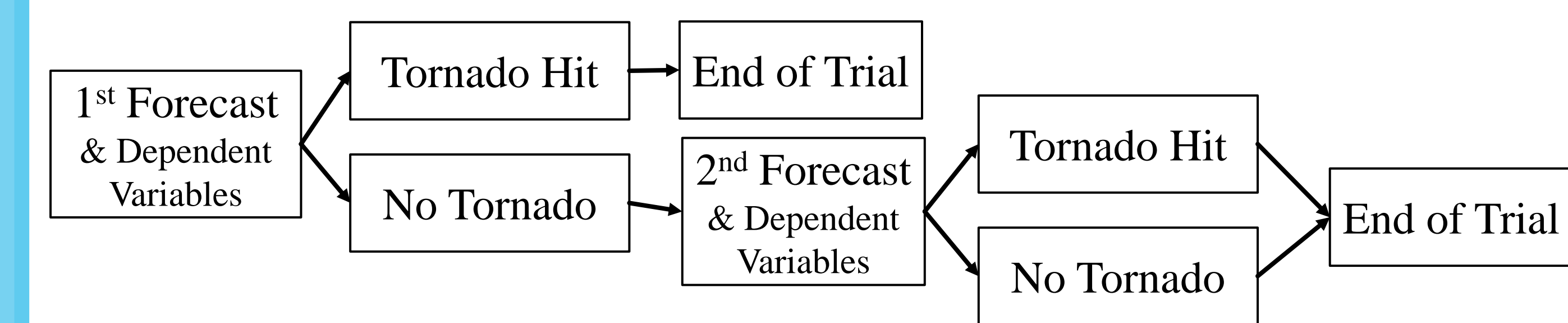
Results Continued



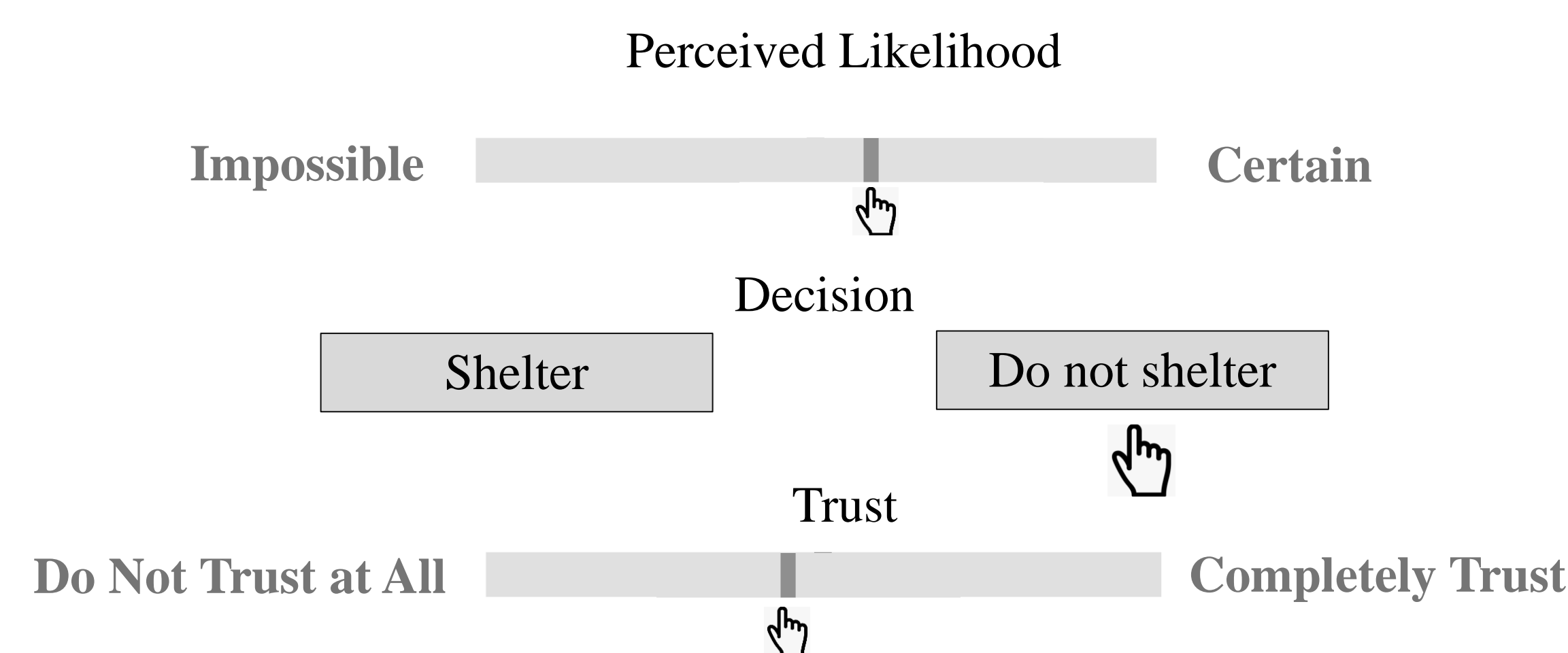
Experimental Procedure

Scenario: Imagine that you were traveling in the Southeastern US and received tornado warning from a cell phone app. The potential windspeed of the tornado is 86-135 miles per hour.

- Each trial consisted of 1 or 2 forecasts based on underlying probability defined as tornado frequency: 30% tornado hits for 30% chance trials.
- 2nd forecast issued 10 virtual minutes after the 1st unless a tornado hit after 1st forecast
- 39 trials
- Participants: 293 (46% female) Prolific participants from Southeastern US.



Dependent Variables at Each Forecast:

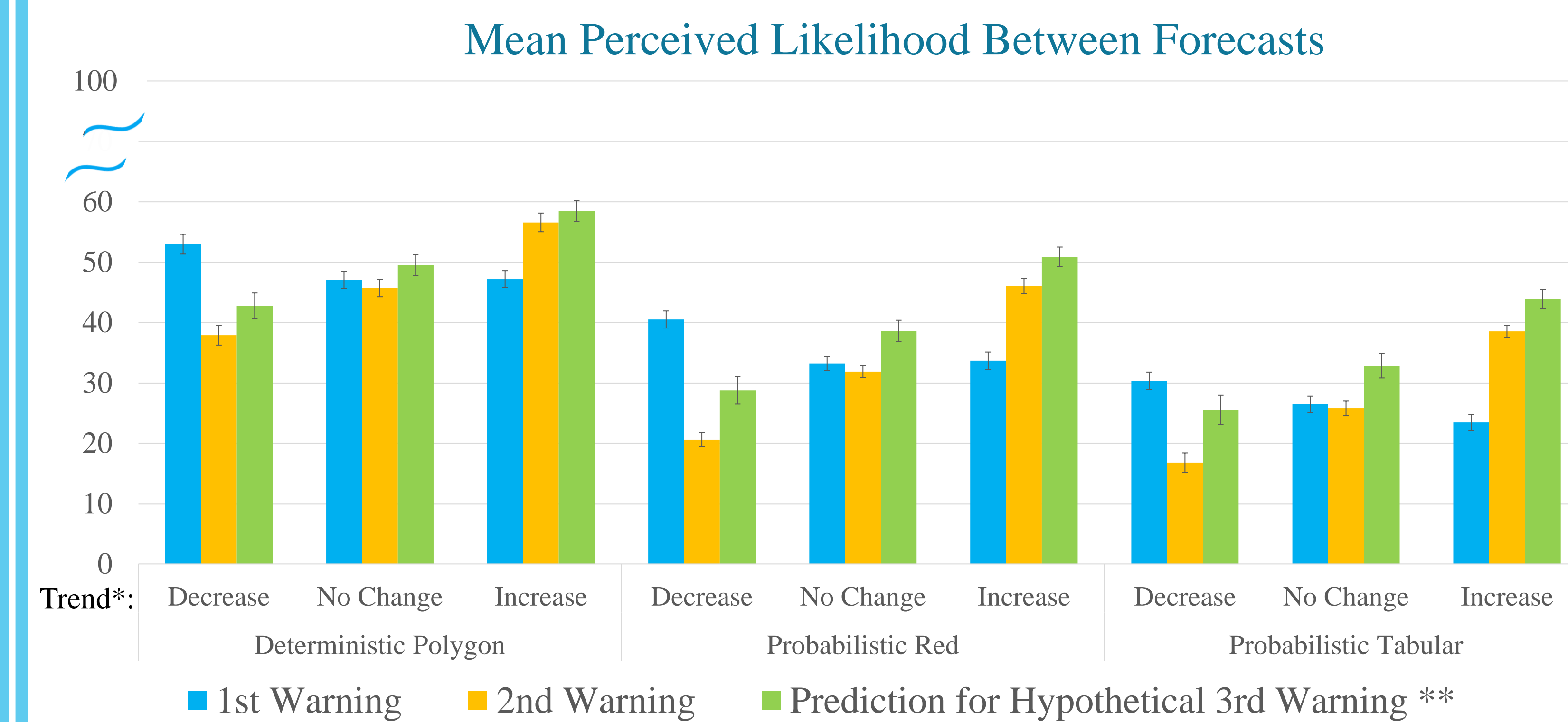
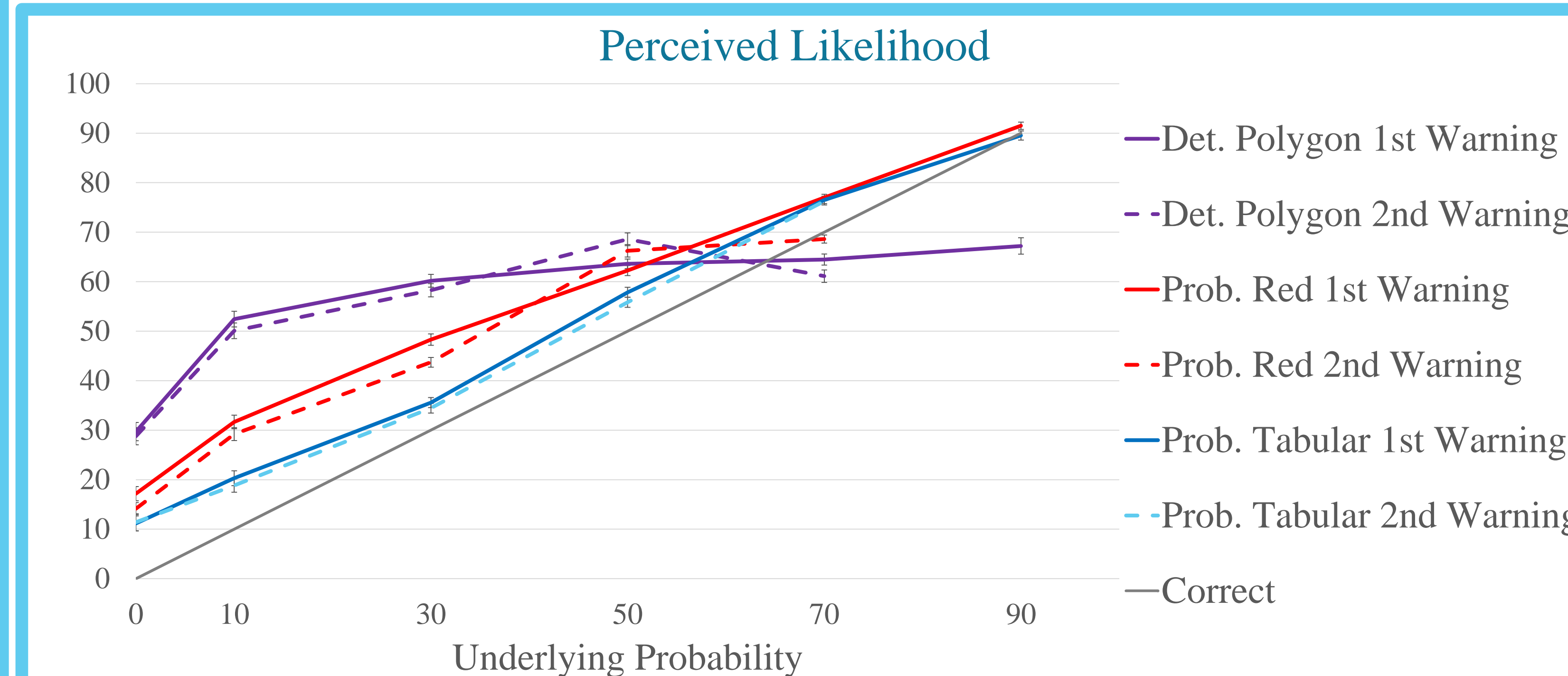


Point Structure to Encourage Engagement:

Goal: End with as many points as possible. Start with 25,000 points.

Decision	Cost	Penalty if Tornado Hits
Take Shelter	90	0
Not Shelter	0	1000

Results



* Trend: relationship of likelihood between the 1st and 2nd forecast.
 ** Prediction of hypothetical 3rd forecast likelihood (will the trend continue?)

- Participants’ perceived trends corresponded to the change in underlying probability between 1st and 2nd forecast.
- Prediction for the 3rd forecast was higher than for 2nd forecast for ALL trends. $F(2,580) = 14.11, p < .001, \eta_p^2 = .05$
- This effect **was not different** among the formats. $F(2,290) = 2.16, p = .117$
- Polygon perceived higher likelihood than other formats. $F(2,290) = 16.29, p < .001, \eta_p^2 = .10$

Conclusions

- Participants recognize the trend in evolving, updated tornado forecasts, but tend to predict the likelihood will increase in the near future.
 - Perhaps due to defensive pessimism and cautiousness in face of imminent threats. This is consistent with previous research where participants took shelter and perceived a non-zero likelihood even when explicitly told 0% probability of a tornado (Qin et al., 2023).
- Participants showed higher overall trust & increased trust in the forecast in “decreasing trends.”
 - Perhaps a decrease of the probability was viewed as good news and inspired greater trust for that reason, consistent with a desirability bias (Windschitl et al., 2010).
- Forecast consistency does NOT increase trust, contradicting the notion in the weather forecasting community that forecasts should be consistent to preserve user trust (Burgeno & Joslyn, 2020).

References

Burgeno, J. N., and S. L. Joslyn, 2020: The Impact of Weather Forecast Inconsistency on User Trust. *Wea. Climate Soc.*, 12, 679–694, <https://doi.org/10.1175/WCAS-D-19-0074.1>.

Qin, C., Joslyn, S., Savelli, S., Demuth, J., Morss, R., & Ash, K. (2023). The impact of probabilistic tornado warnings on risk perceptions and responses. *Journal of experimental psychology: Applied*, 10.1037/xap0000486. Advance online publication. <https://doi.org/10.1037/xap0000486>

Windschitl, P., Smith, A., Rose, J., & Krizan, Z. (2010). The desirability bias in predictions: Going optimistic without leaving realism. *Organizational Behavior and Human Decision Processes*, 111, 33-47.

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