The Compensatory Nature of Algorithm Aversion

Effects of algorithm accuracy, convenience, and sense of uniqueness on choice of medical provider

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Summary

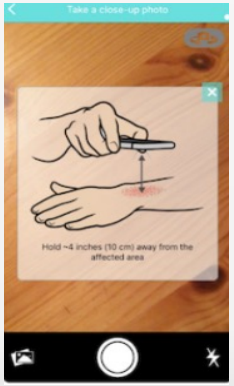
Rationale: Algorithm aversion is often defined as preference for human over algorithmic advice ***even when the algorithm outperforms the human***. This ignores whether the relative performance of human vs algorithm is made explicit to judges. In most cases accuracy data is either not provided or must be calculated in real time after observing a limited number of trials (e.g., Dietvorst et al., 2015). This may not be unrealistic for people who interact daily with such algorithms, but most medical decisions made by patients are "one shot." In such cases, **summary statistics** of both human and algorithm may be the most intuitive method to help patients make the best provider choice (Castelo et al., 2019). Very little research has assessed the effect of summary statistics, and where research does exist, the results are often misinterpreted (Pezzo & Beckstead, 2020a,b)

Findings: In two online studies (www.prolific.com) we found not only did people opt to use an "AI" device when its accuracy was superior to the doctor's, but even when it was *equal* to and even *below* that of the doctor, *so long as the AI device afforded them some convenience* (i.e., saved them from a lengthy wait to see the human doctor). We showed these effects for both a dermatological case (perceived to have a relatively slow time course) and for a potential cardiac event having a much more acute time course. Fear that the AI device would overlook unique aspects of the patient's condition predicted algorithm aversion overall, but also strengthened the effect of algorithm accuracy in both experiments. However, not all measures of uniqueness produce consistent results.

Experiment 1

Scenario

- See doctor for suspicious mole
- Long line in the waiting room
- Could avoid wait by using an AI device
- Provides diagnosis and Rx using deep learning
- Given summary accuracy data of doctor and AI



DV: Choicer: Wait for doctor OR use AI device?

IVs: *Within-Subject Manipulations*

- Wait Time: 30m, 1hr, 2+hrs
- Device Accuracy: 85%, 90%, 95%
- Doctor Accuracy: FIXED 90%
- Personal Sense of Uniqueness (PSU)
- Uniqueness Neglect Fear (UNF)

Analytic Plan: Multilevel logistic regression
N = 172

Results

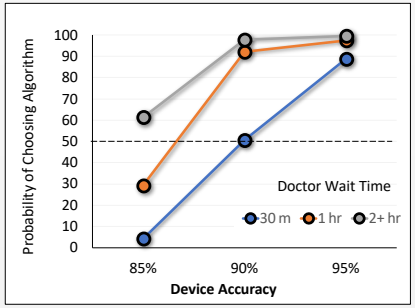
- Device Accuracy: $F(2, 1512) = 90.4$, $p < .001$, $\eta^2 = .11$
- Doctor Wait Time: $F(2, 1512) = 44.7$, $p < .001$, $\eta^2 = .06$
- PSU: $F(1, 1512) < 1$, $p = .61$
- UNF: $F(1, 1512) = 90.0$, $p < .001$, $\eta^2 = .06$
- UNF x Accuracy, $F(2, 1512) = 3.66$, $p = .03$ $\eta^2 = .005$
- All other interactions were non-significant including Accuracy x Wait Time
- SE for Figure 1 hover around 3-4%

Interpretation

- People will accept diagnosis from algorithm with accuracy ≥ doctor
- Even inferior accuracy is "good enough" if reduces long (2+hrs) wait time
- Those scoring high on UNF were most resistant, overall to AI device, but also were most strongly affected by accuracy information.
- PSU unrelated to algorithm aversion.

Limitations

- Even malignant mole affords some time for patient to see a doctor later
- It is not immediately life threatening
- Study 2 examines trust in AI where an immediate diagnosis is required to rule out a potentially life-threatening condition.



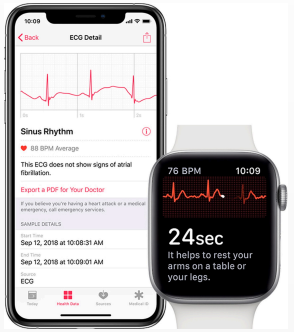
References

- Castelo, N., Bos, M. W., & Lehmann, D. R. (2019). Task-Dependent Algorithm Aversion. *JMR, Journal of Marketing Research*, *56*(5), 809–825.
- Dietvorst, B. J., Simmons, J. P., & Massey, C. (2015). Algorithm aversion: people erroneously avoid algorithms after seeing them err. *JEP. General*, *144*(1), 114–126.
- Longoni, C., Bonezzi, A., & Morewedge, C. K. (2019). Resistance To Medical Artificial Intelligence. *The Journal of Consumer Research*, *46*(4), 629–650.
- Pezzo, M. V., & Beckstead, J. W. (2020b). Algorithm aversion is too often presented as though it were non-compensatory: *JDM*, *15*(3), 449–451.
- Pezzo, M. V., & Beckstead, J. W. (2020). Patients prefer artificial intelligence to a human provider, provided the AI is better than the human: *JDM*, *15*(3), 443.

Experiment 2

Scenario

- Serious chest pains during ride to airport
- Prior history of panic attacks
- If detour to hospital, will miss flight
- May lose business deal to another company
- No medical staff at airport or on plane
- Flight is 9 hours long over an ocean
- Apple Watch (ECG) says you're fine



DV: Likelihood you will board plane now

IVs: *Within-Subjects Manipulations*

- Wait Time: 1wk, 1mo, 6mos
- AI Accuracy: 90%, 95%, 99%
- Uniqueness Neglect Fear (UNF)

Analytic Plan: Repeated Measures ANOVA (3 x 3 x 5) N = 139 subjects

Results

- Device Accuracy: $F(2, 133) = 69.1$, $p < .001$, $\eta^2 = .34$
- Trip Wait Time: $F(2, 252) = 20.3$, $p < .001$, $\eta^2 = .13$
- UNF: $F(4, 133) = 7.4$,, $p < 001$, $\eta^2 = .18$
- UNF x Device Accuracy: $F(8, 133) = 2.7$, $p = .008$, $\eta^2 = .07$

Interpretation

- Device accuracy information has strong effect on believing algorithm
- This effect is strongest those with high scores on fear of uniqueness neglect (UNF)
- People willing to assume more risk for convenience (i.e., reduced wait time)
- Medical AI may be accepted in rural areas as replacement for human doctor and may help to reduce number of unnecessary trips to ER