Study Information

Title (required)

Understanding Medical Algorithm Phenomenon

Authors (required)

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Description (optional)

The goal of this study is to evaluate the various ways people conceptualize medical decision-making and medical decision-makers in view of the use of intuition and quantitative reasoning.

Hypotheses (required)

1.a.1 - People will perceive diagnostic medical decisions as requiring more quantitative reasoning than prescriptive medical decisions.

1.a.2 - People will perceive diagnostic medical decisions as requiring more quantitative reasoning than preventative medical decisions.

1.a.3 - People will perceive prescriptive medical decisions as requiring more quantitative reasoning than preventative medical decisions.

1.b.1 - People will perceive medical decisions about physical health as requiring more quantitative reasoning than decisions about mental health.

1.b.2 - People will perceive medical decisions about bodily injury as requiring more quantitative reasoning than decisions about acute sickness.

2.a.1 - People will perceive a doctor as being more capable of intuition-based decision-making than an algorithm

Design Plan

In this section, you will be asked to describe the overall design of your study. Remember that this research plan is designed to register a single study, so if you have multiple experimental designs, please complete a separate preregistration.

Study type (required)

Observational Study - Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, natural experiments, and regression discontinuity designs.

Blinding (required)

No blinding is involved in this study.

Study design (required)

This study is a within-subjects, repeated measures survey where we are asking participants to make judgments about various medical decisions and various medical decision-makers. We will be utilizing both paired samples t-tests and repeated measures ANOVA to determine differences between the judgments.

Randomization (optional)

There is no participant randomization occurring within this study.

Sampling Plan

Existing data (required)

N/A

Explanation of existing data (optional)

N/A

Data collection procedures (required)

We intend to recruit participants using the Cloud Research Platform's Prime Panel feature. The study will take approximately 20 minutes and participants will be compensated $1.75 for their time.

Once recruited, participants will be sent to complete a Qualtrics survey where they will be asked about their judgments concerning medical decision-making and medical decision makers before filling out some personal demographics.

Sample size (required)

Our target sample size for this survey is 186. We may receive more participants due to Prime Panels oversampling. These extra participants will be kept in the study.

Sample size rationale (optional)

We are abiding by three criteria to determine how many participants we need for this study.

1. To collect at least 100 participants.
2. To utilize half the smallest effect found in our previous within-subjects studies on the difference in warmth and competence for algorithms versus human recommendations.

Differences in Warmth and Competence

Study 2

WS:

Warmth: 0.6201908

Compentence : 0.5346006

Study 3

WS:

Warmth: 0.6455012

Compentence : 0.49014479

Half the smallest within-subjects effect: 0.49014479

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t tests - Means: Difference between two dependent means (matched pairs)

Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	Two
	Effect size dz	=	0.2450724
	α err prob	=	0.01666666666
	Power (1-β err prob)	=	0.8
Output:	Noncentrality parameter δ	=	3.2696736
	Critical t	=	2.4169475
	Df	=	177
	Total sample size	=	178
	Actual power	=	0.8021080

Stopping rule (optional)

N/A

Variables

In this section you can describe all variables (both manipulated and measured variables) that will later be used in your confirmatory analysis plan. In your analysis plan, you will have the opportunity to describe how each variable will be used. If you have variables which you are measuring for exploratory analyses, you are not required to list them, though you are permitted to do so.

Manipulated variables (optional)

N/A

Measured variables (required)

Our outcomes are linked to 4 different scales.

The first scale measures participants' perceived percentage of quantitative reasoning (versus intuition) required by medical professionals to make accurate medical decisions for fifteen different medical decisions. This scale goes from 0 (Requires only Intuition and Personal Experience) to 100 (Requires only Quantitative Reasoning).

The fifteen decisions:
Recommending Stretching to Prevent Injury
Determining if a Bone is Broken
Recommending Knee Surgery
Prescribing Pain Medication for a Knee Injury
Recommending Meditation and Exercise to Promote Mental Health
Diagnosing Depression
Prescribing Anti-Depressants and Cognitive Behavioral Therapy for Depression
Recommending Vitamin C + Zinc to Fight Off Infections
Diagnosing Strep Throat
Prescribing Anti-Biotics for Strep Throat
Recommending a Strict Diet to Promote Better Physical Health
Diagnosing Diabetes
Prescribing Insulin and a Change in Diet for Diabetes
Recommending Walking 3 Kilometers a day, 50 Deep Breaths, and 8 Hours of Sleep Each Night to Promote Wellness
Medical Decisions in General

The second scale measures the perceived capability of eleven distinct medical decision-makers to use quantitative reasoning to make recommendations about health. This goes from 0 (Not Capable at All) to 10 (Completely Capable).

The third scale measures the perceived capability of eleven distinct medical decision-makers to use intuition to make recommendations about health. This goes from 0 (Not Capable at All) to 10 (Completely Capable).

The fourth scale measures the participants level of trust for eleven distinct medical decision-makers to make recommendations about health. This scale goes from 0 (Do Not Trust at All) to

10 (Completely Trust).

The eleven medical decision-makers:
Doctor
Registered Nurse
Virtual/Remote Doctor
Therapist
Personal Trainer
Medical Artificial Intelligence (AI)
AI-Powered Digital Diagnostic Tools
AI-powered Therapy Chat Bot
AI-Driven Diet & Fitness App
Doctor Utilizing AI
A Lay Individual

Indices (optional)
To determine the differences between preventative, diagnostic, and prescriptive medical decisions, we will create an average of the within-person responses for each category of medical decision.
Diagnostic Decisions:

1. Diagnosing a Broken Bone
2. Diagnosing Depression
3. Diagnosing Strep Throat
4. Diagnosing Diabetes

Prescriptive Decisions:

1. Prescribing Pain Medication for a Knee Injury
2. Prescribing Anti-Depressants and Cognitive Behavioral Therapy for Depression
3. Prescribing Anti-Biotics for Strep Throat
4. Prescribing Insulin and a Change in Diet for Diabetes

Preventative Decisions:

1. Recommending Stretching to Prevent Injury
2. Recommending Meditation and Exercise to Promote Mental Health
3. Recommending Vitamin C + Zinc to Fight Off Infections
4. Recommending a Strict Diet to Promote Better Physical Healt

To determine the differences between decisions made about bodily injuries, mental health, acute sickness, and chronic sickness, we will create an average of the within-person responses for each category of medical decision.
Bodily Injury:

1. Recommending Stretching to Prevent Injury
2. Diagnosing a Broken Bone
3. Prescribing Pain Medication for a Knee Injury

Mental Health:

1. Recommending Meditation and Exercise to Promote Mental Health
2. Diagnosing Depression
3. Prescribing Anti-Depressants and Cognitive Behavioral Therapy for Depression

Acute Sickness:

1. Recommending Vitamin C + Zinc to Fight Off Infections
2. Diagnosing Strep Throat
3. Prescribing Anti-Biotics for Strep Throat

Chronic Sickness:

1. Recommending a Strict Diet to Promote Better Physical Health
2. Diagnosing Diabetes
3. Prescribing Insulin and a Change in Diet for Diabetes

If participants are missing any of these values, we will take the average of the remaining responses for the category.

Analysis Plan

You may describe one or more confirmatory analysis in this preregistration. Please remember that all analyses specified below must be reported in the final article, and any additional analyses must be noted as exploratory or hypothesis generating.

A confirmatory analysis plan must state up front which variables are predictors (independent) and which are the outcomes (dependent), otherwise it is an exploratory analysis. You are allowed to describe any exploratory work here, but a clear confirmatory analysis is required.

Statistical models (required)

Our primary analysis will be a series of paired samples t-tests between individual items and groups.

1. We will compare people's perceptions of diagnostic decisions and prescriptive decisions.
2. We will compare people's perceptions of diagnostic decisions and preventative decisions.
3. We will compare people's perceptions of prescriptive decisions and preventative deicions.
4. We will compare people's perceptions of decisions about bodily injury and decisions about mental health.
5. We will compare people's perceptions of decisions about bodily injury and decisions about acute sickness.
6. We will compare people's perceptions of the capability of doctors using intuition and medical artificial intelligence using intuition.
7. We will compare people's perceptions of the capability of doctors using quantitative reasoning and medical artificial intelligence using quantitative reasoning.
8. We will compare people's reported trust in doctors and medical artificial intelligence.

Transformations (optional)

If you plan on transforming, centering, recoding the data, or will require a coding scheme for categorical variables, please describe that process.
Example: The "Effect of sugar on brownie tastiness" does not require any additional transformations. However, if it were using a regression analysis and each level of sweet had been categorically described (e.g. not sweet, somewhat sweet, sweet, and very sweet), 'sweet' could be dummy coded with 'not sweet' as the reference category.
More information: If any categorical predictors are included in a regression, indicate how those variables will be coded (e.g. dummy coding, summation coding, etc.) and what the reference category will be.

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Inference criteria (optional)

We will be using the alpha = .05 criterion to determine significance.

Data exclusion (optional)

We don't intend to exclude any participants.

Missing data (optional)

We intend to include all data from which participants have answered all the questions for our dependent variables.

Exploratory analysis (optional)

Comparing perceived required quantitative reasoning needed to make accurate medical decisions for each medical decision.
Comparing the perceived individual capabilities of using intuition.
Comparing the perceived individual capabilities of using quantitative reasoning.
Comparing the perceived level of trust for each decision maker.

We will also do exploratory mixed effects model to determine if any of the differences are due to between person differences.

We will do a person-as-an-effect-size analysis for the planned analyses.

Other

Other (Optional)
If there is any additional information that you feel needs to be included in your preregistration, please enter it here. Literature cited, disclosures of any related work such as replications or work that uses the same data, or other context that will be helpful for future readers would be appropriate here.