**Study Information**

Hypotheses

Interoceptive abilities will be positively correlated with specific primal beliefs, such as perceiving the world as “alive”, “understandable” and “hierarchical”.

**Design Plan**

Study type

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

* No blinding is involved in this study.

Is there any additional blinding in this study?

*No response*

Study design

Correlational cross-sectional study containing multiple tasks.

Each participant will undergo different tasks and questionnaires:

* Resting state: 8-minute eyes closed followed by a resting state assessment (Diaz et al., 2014)
* Questionnaires:
  + Interoceptive Accuracy Scale (IAS, Murphy et al., 2020). Assesses their subjective ability to detect internal body signals accurately.
  + Multidimensional Assessment of Interoceptive Awareness second version (MAIA-2, Mehling et al., 2018). This questionnaire measures participants' subjective interoceptive awareness across various dimensions.
  + Primal Inventory 99 (PI-99, Clifton et al., 2019). Assesses their belief in the current world we live in across multiple dimensions.
* Interoception Tasks:
  + Heartbeat counting task (HBC, Schandry, 1981). Participants will be required to count the number of heartbeats that occur during a specific period, which will vary based on the length of the randomly determined trial order. The recorded number of heartbeats will be compared with the number of heartbeats participants counted, without taking their pulse. There are a total of 6 trials with the length of 20, 25, 30, 35, 40 and 45 seconds.
  + Tapping task (TAP, Smith et al., 2021). Participants will be asked to tap the spacebar with any rhythm they prefer, and with constant speed of tapping for a total of 90 taps in the first trial. Then they will be asked to tap two more trials but with different speed than the first trial, one faster and another slower to calculate the beat-to-tap consistency. To calculate it, each tap will be matched to the nearest heartbeat, and the time difference between the response and the corresponding event was determined. This resulted in response times that could be either positive or negative. To establish a baseline for random tapping, we estimated the expected values by using the participant's actual recorded heartbeats and the number of responses. These responses were randomly distributed within the trial using a uniform distribution. Subsequently, each participant's actual tapping behaviour was transformed into a Z-score by subtracting the mean and dividing by the standard deviation of the estimated distribution. This allowed for a standardized measure of beat-to-tap consistency, independent of individual variations in response times.

Randomization

After completing the resting state task, participants will be divided into two groups. Half of the participants will begin with the objective measurements of interoceptive abilities, which will go through TAP and HBC. These tasks will be followed by the IAS, MAIA-2, and PI-99 in random order. The other half of the participants will start with the subjective measurements of interoceptive abilities, which consist of the IAS, MAIA-2 and PI-99 in random order. Subsequently, they will complete the TAP followed by the HBC. The TAP is always before HBC because participants will be instructed to tap with any rhythm they prefer during TAP, then they should only start paying attention on their heartbeat during the HBC. To determine the task order for each participant, a random assignment will be made based on the participant's ID number. Participants with odd-numbered IDs (1, 3, 5, 7...) will follow the first order (objective measurements of interoceptive ability first), while participants with even-numbered IDs (2, 4, 6, 8...) will follow the second order (subjective measurements of interoceptive ability first). This randomization approach aims to minimize any potential impact of, for example, those completing the questionnaires first and self-rating as good detectors might affect their performance on the subsequent heartbeat tasks, or vice versa. By observing the possible effects of controlling the task order, we can better understand the overall outcomes.

**Sampling Plan**

Existing Data

Registration prior to creation of data

Explanation of existing data

*No response*

Data collection procedures

Adult participants from the student population, encompassing individuals of any gender and ethnicity, will be recruited via social media and recruitment posters for the study. Upon completion of their participation, participants will be rewarded with 10 GBP. The data collection is expected to be completed within a month.

*No files selected*

Sample size

The target sample is 100 participants.

Sample size rationale

Preliminary data suggested correlations of r ± .25 between primal beliefs and dimensions of the IAS. A Power analysis () suggests that the required sample size = [(Zα+Zβ)/C]2 + 3 = 98.

Stopping rule

*No response*

**Variables**

Manipulated variables

*No response*

*No files selected*

Measured variables

* In the IAS, participants were asked to rate their self-reported interoceptive accuracy for 21 items using a scale ranging from 0 to 100. A rating of 0 corresponded to 'strongly disagree,' while a rating of 100 indicated 'strongly agree.' An example item is ‘I can always accurately perceive when my heart is beating fast’. No specific dimensions were measured in the IAS as the value of all responses will be combined for a final score of the self-reported interoceptive accuracy.
* In the MAIA-2, participants will be requested to assess their self-reported interoceptive awareness for 37 items on a scale from 0 to 100. On this scale, a rating of 0 represented 'never,' while a rating of 100 indicated 'always.' Some of the example dimensions in which the MAIA-2 measures are ‘noticing (I notice when I am uncomfortable in my body)’, ‘emotional awareness (I notice how my body changes when I feel happy / joyful)’ and ‘body listening (I listen to my body to inform me about what to do)’.
* In the PI-99, participants were asked to evaluate their self-reported beliefs about the world for 99 items using a scale ranging from 0 to 100. A rating of 0 corresponded to 'strongly disagree,' while a rating of 100 indicated 'strongly agree.' Some of the example dimensions in which the PI-99 measures are ‘alive (What happens in the world is meant to happen)’, ‘understandable (The world is a confusing place where many skills and subjects are too hard to figure out)’ and ‘hierarchical (Humans, animals, plants, and pretty much everything else can be organised by how important or good they are)’.
* In the HBC, the objective measurement of interoceptive ability will involve comparing participants' actual number of heartbeats during a given period with their reported number of heartbeats. This comparison will yield a percentage error value, where a lower percentage error indicates a better interoceptive ability and a higher percentage error suggests a lesser ability.
* In the TAP, beat-to-tap consistency will be measured by matching each tap to the nearest heartbeat to calculate the time difference in between, followed by the random distribution of their recorded heartbeats and responses to establish a baseline for random tapping, then converting the actual tapping behaviour into a Z-score.

*No files selected*

Indices

*No response*

*No files selected*

**Analysis Plan**

Statistical models

Bayesian correlation tests will be conducted to analyse the relationship between each interoceptive ability measurement (IAS, MAIA-2, HBC, and TAP) and primal beliefs.

*No files selected*

Transformations

*No response*

Inference criteria

Bayes Factor > 6.

Data exclusion

*No response*

Missing data

*No response*

Exploratory analysis

*No response*

**Other**

Other

*No response*