Ethical Review Application (ER/MP667/2) Magdalena Pfaff

Project Title	Exploring the link between Interoception and Primal Beliefs
Status	Approved
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Applicant Status	PG (Research)
Department	Life Sciences
Supervisor	Makowski, Dominique
Project Start Date	11-Feb-2024
Project End Date	30-Apr-2024
External Funding in place	No
External Collaborators	No
Funder/Project Title	
Name of Funder	
Project Description	This proposal is the same as the previously approved project ER/ASF25/2 (approved on 19/11/2023) to continue collecting data with a new experimenter. This study aims to investigate the link between Primal World Beliefs and Interoception. Participants will undertake, in one sitting, different tasks (resting and interoceptive tasks) and questionnaires. The interoception tasks will provide objective measures of interoceptive abilities, which include the tapping task (TAP) and the heartbeat counting task (HCT; Schandry, 1981). The questionnaires will provide subjective measures of interoceptive abilities: the Interoceptive Accuracy Scale (IAS; Murphy et al., 2020), the Multidimensional Assessment of Interoceptive Awareness second version (MAIA-2, Mehling et al., 2018) and the Primal Inventory 99 (PI-99, Clifton et al., 2019). Firstly, participants will undergo a resting state where they will be instructed to close their eyes for 8 minutes and then asked to fill out a resting state assessment (Diaz et al., 2014). After completion of this task, participants will be divided into two groups. Those with odd-numbered IDs (1,3,5…) will begin with the objective measures of interoceptive ability - the TAP and HCT. These tasks will be followed by the IAS, MAIA-2, and PI-99 in random order. Participants with even-numbered IDs (2,4,6..) will start with the subjective measures of interoceptive ability, namely the IAS, MAIA-2, and the PI-99; followed by the TAP and HCT. This aims to minimise any potential impact of the questionnaires on the performance of the tasks, and vice versa; for example, participants who respond to the questionnaires first and self-rating as good detectors might perform differently on the subsequent heartbeat tasks. Therefore, the overall outcomes are better understood by observing the possible effect of controlling the task order.

Ethical Review Form Section A (ER/MP667/2)	
Question	**Response**
>> Checklist	
A1. Will your study involve participants who are currently or potentially vulnerable or unable to give informed consent or in a dependent position (e.g. people under 18, people with learning difficulties, over-researched groups or people in care facilities)?	No
A2. Will participants be required to take part in the study without their consent or knowledge at the time (e.g. covert observation of people in non-public places), and / or will deception of any sort be used? Please refer to the British Psychological Society Code of Ethics and Conduct (or similar guidelines) for further information.	No
A3. Unless specifically and clearly consented (e.g. a media release form), will it be possible, through a research output, to identify participants in any way? (This does not include taking email details for participant prize draws or identifying participants from signed consent forms or holding identity encryption spreadsheets that are stored securely separate from the research data).	No
A4. Might the study induce psychological stress or anxiety, or produce humiliation or cause harm or negative consequences beyond the risks likely to be encountered in the everyday life of the participants?	No
A5. Is there a risk that the research topic might lead to disclosures from the participant concerning their beliefs, involvement in illegal actions or any other activities that may represent a threat to themselves or others?	No
A6. Will the study involve collecting any personal special category information* in a form that could allow the participant/ participants to be identified? [* identifiers relating to race, ethnic origin, politics, religion, trade union membership, philosophical beliefs, genetics, biometrics, health, sex life or sexual orientation]	No
A7. Will any drugs, placebos or other substances (such as food substances or vitamins) be administered as part of this study and will any invasive or potentially harmful procedures of any kind will be used?	No
A8. Will your project involve working with any substances and / or equipment which may be considered hazardous?	No
A9. Will your study involve the taking and/or storage of human tissue that falls under the Human Tissue Act (HTA)? http://www.sussex.ac.uk/staff/research/governance/erp_overview/humantissue	No
>> Risk Assessment	
A10. If you have answered Yes to ANY of the above questions, your application may be considered as HIGH risk. If, however you wish to make a case that your application should be considered as LOW risk please enter the reasons here. Researchers should note that SREOs or C-RECs may decide NOT to agree with the case that you have made.	

Ethical Review Form Section B (ER/MP667/2)	
Question	**Response**
>> Data Collection and Analysis (Please provide full details)	
B1. PARTICIPANTS: How many people do you envisage will participate, who are they, and how will they be selected?	We will attempt to recruit 100 participants. Participants will be adults from the student population
B2. RECRUITMENT: How will participants be approached and recruited?	Recruitment will be done via social media and recruitment posters.It is possible to participate by scanning the QR code on the poster to book a time and date or by contacting the researcher's university email address directly

B3. METHOD: What research method(s) do you plan to use; e.g. interview, questionnaire/self-completion questionnaire, field observation, audio/audio-visual recording?	Firstly, participants will complete a resting state task for 8-minutes. Then depending on their ID number, they will either perform the self-completion questionnaires first and then the tasks, or vice versa. The TAP task will ask participants to tap the spacebar at different rhythms, this provides a measure of beat-to-tap consistency by matching each tap to the nearest heartbeat to calculate the time difference in between. The HCT task will ask participants to count the number of heartbeats that occur during a specific period, which will then be compared to participants actual number of heartbeats. Bayesian correlation tests will be conducted to analyse the relationship between each interoceptive feature and primal beliefs. During the tasks, physiological data, including cardiac activity and EEG data. Cardiac activity will be collected through a BITalino device via ECG, with disposable electrodes (PluX biosignals brand, https://www.pluxbiosignals.com/collections/electrodes/products/gelled-self-adhesive-disposable-ag-agcl-electrodes-pack-of-200) placed on the collarbones and above the hipbone (or PPG a fingertip sensor if the former is impossible), which are non-invasive surface physiological measures. The researchers will receive the proper training to handle the equipment as well as ensure participants' comfort and safety during the setup and recording. Electroencephalography (EEG) will be conducted using the Muse 2 headset, a lightweight and non-intrusive device. The headset is designed to be worn comfortably behind the ears and on the forehead, utilizing four electrodes to capture electrical signals from the brain's temporal and frontal lobes. Specifically, the four channels (TP9, TP19, AF7, and AF8) will be recorded using dry electrodes placed at these sites.Although this headset is commercially available for meditation purposes, it will be used exclusively for research in our study. We will recomend participants to hear a headband to ensure unobstructed contact between the electrodes and their skin. EEG will be used to measure heartbeat evoked potentials. Participants will be instructed beforehand about the setup (the fact that electrodes will be placed on their collarbones and above the hip) and to wear loose and comfortable clothes. Upon placement of the first electrode, researchers will ask and look up for signs of potential allergic reaction (redness and discomfort), in which case the device will be removed, and alternative measures will be taken (pulse via finger-tip PPG).

B4. LOCATION: Where will the project be carried out e.g. public place, in researcher's office, in private office at organisation?	Upon signing up for the study, participants will be invited to come to the Psychophysiology lab to complete the experiment.
B5. PARTICIPANT WELLBEING: Will the study involve engaging participants in the discussion of potentially distressing or sensitive topics? (e.g. sexual activity, drug use, ethnicity, political behaviour, potentially illegal activities). If so, please set out how you will manage the well-being of participants.	No
>> Confidentiality and Anonymity	
B6. Will questionnaires be completed anonymously and returned indirectly?	Yes
B7. Will research data only be identifiable by a unique identifier (e.g. code/pseudonym)? If Yes, please explain how this will be attributed in B11a below.	Yes
B8. Will lists of identity numbers or pseudonyms linked to names and/or addresses be stored securely and separately from the research data? If Yes, explain how this will occur in B11a below.	No
B9. Will all place names and institutions which could lead to the identification of individuals or organisations be changed unless this is consented to explicitly in the consent form?	Yes
B10. Will all personal information gathered be treated in strict confidence and never disclosed to any third parties?	Yes
B11. Can you confirm that your research records will be held in accordance with data protection regulations? (http://www.sussex.ac.uk/ogs/policies/information/dpa)	Yes
B11a. Please explain how ANY identifiable personal and/or research data will be managed and securely stored ensuring that participants have given appropriate informed consent for this.	All data will be used for nothing other than the explicit purpose of our study. Since participants must enter their names to sign the information and consent form, the names and participant IDs we assigned will be stored in an Excel document protected by a password, in case they want to withdraw their data. We will record behavioural data, 4 EEG channels (used for heartbeat-evoked potentials), physiological measures (ECG, PPG, RSP) - used in the physiological tasks - and accelerometer data (used to identify noisy data segments). Raw data will be stored in a box folder accessible only to the PI and researchers.
B12. Do you intend to use the research data for any purpose other than that for which consent is explicitly given? If so, please explain below	No

B12a. If you answered NO to any of the above in this section (or think more information could be useful to the reviewer) please explain here:	The anonymised and unidentified data will be made available open-access on OpenNeuro after the experiment's completion.
>> Informed Consent and Recruitment of Participants	
B13. Will all respondents be given an Information Sheet and be given adequate time to read it before being asked to agree to participate?	Yes
B14. Will all participants taking part in an interview, focus group, observation (or other activity which is not questionnaire based) be asked to sign a consent form? If you are obtaining consent another way (such as verbally), please explain under B17 below.	Yes
B15. Will all participants self-completing a questionnaire be asked to show consent to participate by a specific and identifiable action? (Give details in B17 below)	Yes
B16. Will all participants be told that they can withdraw their participation at any time during the research and can ask for their data to be destroyed and/or removed from the project until it is no longer practical to do so?	Yes
B17. If you answered NO to any of the above in this section (or think more information will be useful to the reviewer) please explain here:	
>> Context	
B18. Is DBS (Disclosure and Barring Service) clearance necessary for this project? If yes, please ensure you complete the next question.	No
B19. Are any other ethical clearances or permissions (internal or external) required? Please see the help text (i) for further details.	No
B19a. If yes, please give further details including the name and address of the organisation. If other ethical approval has already been received please attach evidence of approval, otherwise you will need to supply it when ready. (You do not need to provide evidence of a current DBS check at this point).	
B20. Does the research involve any fieldwork - Overseas or in the UK?	No
B20a. If yes, where will the fieldwork take place? If undertaken overseas you must attach an OTSSRA form. In the event that the Foreign and Commonwealth Office has specific travel warnings in place for the country (ies) to be visited you will also need to provide a detailed risk assessment. https://www.gov.uk/foreign-travel-advice	
B21. Will any researchers be in a lone working situation?	Yes

B21a. If yes, briefly describe the location, time of day and duration of the lone working. What precautionary measures will be taken to ensure safety of the researcher(s)?	The location of the experiment will be at the Psychophysiology lab, during working university hours. The whole procedure should not take any longer than 1h30 minutes from start to finish. This is not anticipated to carry any risks.
>> Any further concerns	
B22. Are there any other ethical considerations relating to your project which have not been covered above?	No
B22a. If yes, please explain:	

Study Name: [Sensing the body and seeing the world]
Date: [01/12/2023]

University of Sussex

INFORMATION & CONSENT SHEET

INVITATION TO TAKE PART

You are being invited to take part in a research study to understand the relationship between physiological processes (how you experience your body) and how you perceive the world. Thank you for carefully reading this information sheet, a copy of which you can keep for your records. This study is being conducted by Jing Xu and Dr Dominique Makowski from the School of psychology, University of Sussex, who are happy to be contacted (jx205@sussex.ac.uk/ D.Makowski@sussex.ac.uk) if you have any questions.

WHY HAVE I BEEN INVITED TO TAKE PART AND WHAT WILL I DO?

We are testing 100 adults from the student population; the tasks will take approximately one hour to complete. You will have to complete different questionnaires (asking about your connection to your body, as well as general questions about how you view the world) and different tasks that will require you to focus on your heart beats while having it recorded via electrocardiogram (ECG).

ABOUT ECG

The ECG is a simple procedure where sensors are attached to the skin to detect the electrical signals produced by your heart each time it beats. The BiosignalsPlux ECG machine we use is intended for use in life science education and research and is not a medical device. The study is being undertaken for research purposes only and the researchers will not be able to provide any feedback regarding your ECG following participation. If you have any concerns about your heart and/or related health issues you should contact your GP. Further information about ECG is available on the NHS website: https://www.nhs.uk/conditions/electrocardiogram/

PARTICIPANT ADVISORY: SKIN SENSITIVITY TO ELECTRODE MATERIALS

We kindly request that participants refrain from volunteering for the study if they are aware of having sensitive skin to adhesives or the materials used in the electrodes. The electrodes used in the study are primarily composed of silver and silver chloride. If you have experienced skin reactions or allergies to these materials in the past, we advise against participation. Your comfort and well-being are our top priorities, and we appreciate your understanding in ensuring a safe and suitable research environment.

ABOUT EEG

EEG (Electroencephalography) is a method of recording electrical activity in the brain, providing an electrogram representation of brain waves. This is achieved by placing electrodes around the head to measure electrical conductance. In our study, we will be using electrodes on the forehead and behind the ears to capture the electrogram from two different sites. In some cases, a slightly damp cloth may be used to increase conductance and improve the quality of the recorded data. To measure EEG, we will utilise the Muse 2 headset. The Muse 2 headset is lightweight and non-intrusive, ensuring a comfortable experience during the recording session. If you have long hair, we recommend bringing a hairband to ensure unobstructed contact between the electrodes and your skin. For more information on the use of Muse for research please visit: https://choosemuse.com/pages/science.

Although this headset is commercially available for meditation purposes, it will be used exclusively for research in our study. Therefore, we will not be able to provide feedback or information on clinical aspects of the data obtained. If you have any concerns about your brain and/or related health issues you should contact your GP. Further information about EEG is available on the NHS website: https://www.nhs.uk/conditions/electroencephalogram/.

WHAT WILL HAPPEN TO THE RESULTS AND MY PERSONAL INFORMATION?

For further information about this research please contact Jing Xu (jx205@sussex.ac.uk) or the project supervisor Dominique Makowski (D.Makowski@sussex.ac.uk). This research has been approved (ER/JX205/2) by the Sciences & Technology Cross-Schools Research Ethics Committee (C-REC) (crecscitec@sussex.ac.uk). The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

Study Name: [Sensing the body and seeing the world]
Date: [01/12/2023]

University of Sussex

The results of this research will be used to deepen our scientific understanding of the role of the body in psychology and might be used for scientific dissemination. We anticipate being able to provide a summary of our findings on request from 01/06/2024 (jx205@sussex.ac.uk). Your anonymity will be ensured in the way described in the consent information below. Please read this information carefully and then, if you wish to take part, please sign to show *y*ou have fully understood this sheet, and that you consent to take part in the study as it is described here.

CONSENT

- I understand that by signing below I am agreeing to take part in the University of Sussex research described here, and that I have read and understood this information sheet.
- I understand that my participation is entirely voluntary, that I can choose not to participate in part or all of the study, and that I can withdraw at any stage without having to give a reason and without being penalised in any way.
- I understand I can request without penalty that my data be withdrawn and deleted even after the data collection is complete, any time up until the results are analysed (01/04/2024).
- I understand that my personal data will be used for the purposes of this research study and will be handled in accordance with Data Protection legislation. I understand that the University's Privacy Notice provides further information on how the University uses personal data in its research.
- I understand that my collected data will be stored in a de-identified way and kept separate from other details about. Anonymised and de-identified data may be made available on scientific online data repositories to other researchers.
- I understand that my identity will remain confidential in any written reports of this research, and that no information I disclose will lead to the identification in those reports of any individual either by the researchers or by any other party, without first obtaining my written permission.

Name of Participant	University Email of Participant
Date	Signature

For further information about this research please contact Jing Xu (jx205@sussex.ac.uk) or the project supervisor Dominique Makowski (D.Makowski@sussex.ac.uk). This research has been approved (ER/JX205/2) by the Sciences & Technology Cross-Schools Research Ethics Committee (C-REC) (crecscitec@sussex.ac.uk). The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

Participant ID:	**Group:**	**Date:**	**Time:**

Preparation		**Comments**
Set up lab recorder (ID, eeg)		
Sign information & consent form		
Camera		
Respiration belt (A1)		
ECG electrodes (A2)		
Photosensor (A3)		
EEG sensor		
Check EEG signals		
Check BITalino signals		
Show signals to participant		
RS		**Comments**
Name lab recorder file as RS		
Instructions		
Select all 5 channels on lab recorder		
Start lab recorder		
RS		
Stop lab recorder		
TAP		**Comments**
Name lab recorder file as TAP		
Instructions		
Start lab recorder		
TAP		
Stop lab recorder		
HCT		**Comments**
Name lab recorder file as HCT		
Instructions		
Start lab recorder		
HCT		
Stop lab recorder		
Finish		**Comments**
Remove devices		
Debriefing		
Save data file		
Send expenses collection form		
Clean devices for next participant		
Report comments to excel		

Resting State Task

Instructions

A rest period of about 8 minutes is about to start.

Simply **relax** and remain seated quietly with your eyes closed. Please try **not to fall asleep**.

Once the resting period is over, you will hear a beep. You can then open your eyes and proceed.

Once you are ready, close your eyes. The rest period will shortly begin.

Continue

Continue

It's over! Please press continue.

We are interested in the potential feelings and thoughts you may have experienced during the resting period.

Please indicate the extent to which you agree with each statement.

I thought about others

Completely Disagree — Completely Agree

I had difficulty holding onto my thoughts

Completely Disagree — Completely Agree

I thought about my feelings

Completely Disagree — Completely Agree

I thought about people I like

Completely Disagree — Completely Agree

I had rapidly switching thoughts

Completely Disagree — Completely Agree

I had busy thoughts

Completely Disagree — Completely Agree

I thought about things I need to do

Completely Disagree — Completely Agree

I thought about my behaviour

Completely Disagree — Completely Agree

I thought about myself

Completely Disagree — Completely Agree

I thought about solving problems

Completely Disagree — Completely Agree

I thought about the future

Completely Disagree — Completely Agree

I felt tired

Completely Disagree — Completely Agree

I felt happy

Completely Disagree — Completely Agree

I was conscious of my body

Completely Disagree — Completely Agree

I placed myself in other people's shoes

Completely Disagree — Completely Agree

I felt comfortable

Completely Disagree — Completely Agree

I felt relaxed

Completely Disagree — Completely Agree

I thought about my heartbeat

Completely Disagree — Completely Agree

I thought about my breathing

Completely Disagree — Completely Agree

I had my eyes closed

Completely Disagree — Completely Agree

I was able to rate the statements above

Completely Disagree — Completely Agree

Continue

TAP Task

Instructions

In the following task, you will need to tap the spacebar with any rhythm you prefer.

Please **maintain the speed of tapping** until the trial is over.

Press the space bar to begin.

Well done! Now tap with a different, but **slower** rhythm.

Please **maintain the speed of tapping** until the trial is over.

Press the button below to begin.

I'm ready

Well done! This time tap with a different, but **faster** rhythm than the first time.

Please **maintain the speed of tapping** until the trial is over.

Press the button below to begin.

I'm ready

To what extent do you think your tapping rhythm was influenced by other things (e.g., music, surrounding noise, internal sensations...) than your own will?

Not influenced Totally influenced

Continue

Please indicate if you followed or have been influenced by anything in particular while tapping (e.g., music, surrounding noise, internal sensations...)

(e.g., "music in my head", "my breathing", "I was counting time in my head", ...)

Please type here...

Continue

Well done! Now please try to tap **arhythmically** by changing the timing between the presses and making it as much 'unpredictable' and 'random' as you can.

Do continue making new presses until the trial is over.

Press the button below to begin.

I'm ready

Well done! For the final trial, please try to tap **every time you feel a heart beat**.

Do continue making new presses until the trial is over.

Press the button below to begin.

I'm ready

Heartbeat Counting Task

Instructions

In the following task, you will need to count and report the number of heartbeats during several intervals.

Simply **relax** and remain seated quietly while **counting your heartbeat without physically measuring it**.

The interval will start with a '3-2-1' signal, after which you need to count your heartbeats until you hear a beep.

Questions will then be displayed for you to answer.

I am ready

Continue

This trial is over, please press continue.

How many heartbeats did you count?

Enter number

Continue

How confident are you that your answer was correct?

Not confident

Very confident

Continue

About your body sensations...

Below are several statements regarding how accurately you can perceive specific bodily sensations. Please rate on the scale how well you believe you can perceive each specific signal.

For example, if you often feel you need to urinate and then realise you do not need to when you go to the toilet you would rate your accuracy perceiving this bodily signal as low.

Please only rate how well you can perceive these signals without using external cues, for example, if you can only perceive how fast your heart is beating when you measure it by taking your pulse this would not count as accurate internal perception.

I can always accurately perceive when something is going to be ticklish

Strongly Disagree — Strongly Agree

I can always accurately perceive when I need to urinate

Strongly Disagree — Strongly Agree

I can always accurately perceive when I am in pain

Strongly Disagree — Strongly Agree

I can always accurately perceive when I am breathing fast

Strongly Disagree — Strongly Agree

I can always accurately perceive when I am going to pass wind

Strongly Disagree — Strongly Agree

I can always accurately perceive when my muscles are tired/sore

Strongly Disagree — Strongly Agree

I can always accurately perceive when I encounter different tastes

Strongly Disagree — Strongly Agree

I can always accurately perceive when I am hungry

Strongly Disagree — Strongly Agree

I can always accurately perceive when my blood sugar is low

Strongly Disagree — Strongly Agree

I can always accurately perceive when I am going to vomit

Strongly Disagree — Strongly Agree

I can always accurately perceive when I need to defecate

Strongly Disagree Strongly Agree

I can always accurately perceive when I am sexually aroused

Strongly Disagree Strongly Agree

I can always accurately perceive when I am going to sneeze

Strongly Disagree Strongly Agree

I can always accurately perceive when someone is touching me affectionately rather than non-affectionately

Strongly Disagree Strongly Agree

I can always accurately perceive when I am going to burp

Strongly Disagree Strongly Agree

I can always accurately perceive when I am going to cough

Strongly Disagree Strongly Agree

I can always accurately perceive when my heart is beating fast

Strongly Disagree Strongly Agree

I can always accurately perceive when I am thirsty

Strongly Disagree Strongly Agree

I can always accurately perceive when I am hot/cold

Strongly Disagree Strongly Agree

I can always accurately perceive when something is going to be itchy

Strongly Disagree Strongly Agree

I can always accurately perceive when I am going to get a bruise

Strongly Disagree Strongly Agree

Continue

About your body sensations...

Please indicate how often each statement applies to you generally in daily life.

I can maintain awareness of my inner bodily sensations even when there is a lot going on around me

Never Always

When something is wrong in my life I can feel it in my body

Never Always

I notice changes in my breathing, such as whether it slows down or speeds up

Never Always

When I feel physical pain, I become upset

Never Always

I feel my body is a safe place

Never Always

I distract myself from sensations of discomfort

Never Always

I notice that my breathing becomes free and easy when I feel comfortable

Never Always

I start to worry that something is wrong if I feel any discomfort

Never Always

I ignore physical tension or discomfort until they become more severe

Never Always

When I feel unpleasant body sensations, I occupy myself with something else so I do not have to feel them

Never Always

I notice how my body changes when I feel happy / joyful

Never Always

When I am in conversation with someone, I can pay attention to my posture

Never Always

I can notice an unpleasant body sensation without worrying about it

Never Always

When I feel overwhelmed I can find a calm place inside

Never Always

When I am upset, I take time to explore how my body feels

Never Always

I can refocus my attention from thinking to sensing my body

Never Always

When I am in discomfort or pain I cannot get it out of my mind

Never Always

I am able to consciously focus on my body as a whole

Never Always

I can return awareness to my body if I am distracted

Never Always

I notice where in my body I am comfortable

Never Always

When I am tense I notice where the tension is located in my body

Never Always

I can stay calm and not worry when I have feelings of discomfort or pain

Never Always

I can use my breath to reduce tension

Never Always

When I am caught up in thoughts, I can calm my mind by focusing on my body/breathing

Never Always

I notice when I am uncomfortable in my body

Never Always

When I bring awareness to my body I feel a sense of calm

Never Always

I can pay attention to my breath without being distracted by things happening around me

Never Always

I listen to my body to inform me about what to do

Never Always

I trust my body sensations

Never Always

I listen for information from my body about my emotional state

Never Always

When I feel pain or discomfort, I try to power through it

Never Always

I push feelings of discomfort away by focusing on something

Never Always

I am at home in my body

Never Always

I notice how my body changes when I am angry

Never Always

I notice that my body feels different after a peaceful experience

Never Always

I try to ignore pain

Never Always

I can maintain awareness of my whole body even when a part of me is in pain or discomfort

Never Always

Continue

Muse 2

A) Introduction

From:
https://github.com/RealityBending/SussexPhysioProtocol/blob/main/EEG.md#equipment-details

The Muse 2 headset is a reliable and versatile tool for gathering EEG (Electroencephalography) and other physiological data. With its high-quality sensors, researchers can capture and analyse electrical brain activity in real-time or record and store to analyse later. It offers a lightweight and comfortable design for participants, facilitating non-intrusive and longer data collection sessions. Using two electrodes on the front headband of the device aswell as two behind the ear sensors, the Muse 2 headset can record EEG data from the frontal and temporal lobes. On top of its EEG capabilities, the headband tracks heart rate (PPG + Pulse Oximetry), angular velocity (gyroscope), proper acceleration (accelerometer) making this lightweight headset a powerful tool for gathering a range of physiological data without a lengthy setup or making the participant feel uncomfortable with multiple intrusive sensors. The Muse 2 headset has potential uses in various research applications, including cognitive neuroscience, neurofeedback, meditation research, and sleep studies.

B) **Starter Guide**

Based on the original website: https://choosemuse.com/blogs/news/muse-2-starter-guide

Turn On Your Device

To turn on your headband, click the small button next to the charging port on your Muse pod. You'll know it's on when you see blue cascading lights moving back and forth as Muse looks to connect via Bluetooth to your mobile device.

Check Your Battery Life

To check the charge level of your Muse click the power button one more time after the headband has been turned on and it will indicate how charged the headband is by the number of lights that are full. If only one or two are lit up, it may be time to charge. Whereas three lights indicate a full charge.

How to Fit Your Muse

To correctly fit your Muse 2, gently extend the adjustable earpieces while being mindful not to extend further once you feel tension. Overextension can lead to internal damage in your Muse device. Your headband should be extended so that it is slightly larger than your head size before adjusting it on your head.

Place your Muse along the middle of your forehead with the rubber ear sensors resting behind your ears. The earpieces should sit behind your ears just as a pair of glasses would. Adjust both sides simultaneously to tighten it back up for a snug fit that feels comfortable. Both earpieces should be equally extended to ensure there are no gaps and that all sensors have good skin-to-sensor contact. The headband should run across the middle of your forehead – not too high (near your hairline) or too low (near your eyebrows.)

Make sure that there is no hair between the sensors and your skin, as this can prevent Muse from getting a good signal. Move any hair from above or behind your ears as you adjust the fit for the best results. If you have long hair we recommend tying it up.

You may need to adjust your Muse headband a few times to obtain the best fit and most consistent signal quality. Please pause for 30-60 seconds after making any adjustments to allow the signal to settle. In time, you'll find the fit that's right for you and this step will become second nature before you start a meditation session.

When you have finished your session, store your Muse device in a Muse hard case or the original box that it came in to help preserve your device for years to come.

The band should sit snug and comfortable around your head.

Watch the video to learn how to properly fit your Muse S device:

How to Get Good Signal Quality

If you're having difficulty getting a good signal quality there are a couple of different ways to remedy this.

1. Apply a damp tissue or cloth (moistened with water) to the Muse sensors. Give them a gentle wipe to assist conduit of the sensors with your skin.
2. Or use the damp cloth or tissue and run across your forehead and behind the ears to improve sensor connection. You can also take a damp cloth to your forehead and behind your ears to improve signal quality.

C) EEG and EEG recording

EEG (Electroencephalography) is a method of recording electrical activity in the brain, providing an electrogram representation of brain waves. This is achieved by placing electrodes around the head to measure electrical conductance. In our study, we will be using electrodes on the forehead and behind the ears to capture the electrogram from two different sites. In some cases, a slightly damp cloth may be used to increase conductance and improve the quality of the recorded data.

To measure EEG, we will utilize the Muse 2 headset. Although this headset is commercially available for meditation purposes, it will be used exclusively for research in our study. Therefore, we will not be able to provide feedback or information on clinical aspects of the data obtained. The Muse 2 headset is lightweight and non-intrusive, ensuring a comfortable experience during the recording session. If you have long hair, we recommend bringing a hairband to ensure unobstructed contact between the electrodes and your skin.

Electroencephalography (EEG) will be conducted using the Muse 2 headset, a lightweight and non-intrusive device. The headset is designed to be worn comfortably behind the ears and on the forehead, utilizing four electrodes to capture electrical signals from the brain's temporal and frontal lobes. Specifically, the four channels (TP9, TP19, AF7, and AF8) will be recorded using dry electrodes placed at these sites.

The Muse 2 headset is a commercially available device commonly used for capturing meditation biomarkers, and it poses no risk or harm to the participants. It employs non-invasive dry electrodes, ensuring a safe and comfortable data collection experience. In rare instances where the received signal is too weak to be useful, researchers may enhance skin conductance by gently rubbing a slightly damp cloth across the forehead and behind the ears. However, this step is typically unnecessary and, if needed, can be performed by the participants themselves.

Following data collection, the researcher will collect the Muse 2 headset and sanitize it appropriately before its subsequent use. These measures ensure the maintenance of hygiene standards and the participants' well-being throughout the research process.

Instructions: Below are very general statements about the world—not the world we wish we lived in, but the actual world as it is now. Please share your sense of agreement or disagreement. When in doubt, go with what initially **feels true of the real world**. There are no wrong answers. There's no need to overthink. [Item order was randomized for each participant. Response options were *strongly agree*, *agree*, *slightly agree*, *slightly disagree*, *disagree*, and *strongly disagree*.]

About Me vs. not about me
- Whatever is happening around me often feels related to me or something I've done.[A]
- Much of what happens around me feels like it's because of me or related to me somehow.[A]
- My first instinct about events happening around me is that they're unrelated to me or anything I've done.*[A]
- When unsure why something is happening, I often suspect it's got something to do with me.
- My first instinct about things happening around me is that they have to do with me or something I've done.[A]

Abundant vs. barren
- The world is an abundant place.[GE]
- Life overflows with opportunity and abundance.[GE]
- The world feels like a barren place with few opportunities.*[GE]
- The world is an abundant place with tons and tons to offer.[GE]

Acceptable vs. unacceptable
- The world needs to be continually improved rather than accepted.*
- Rather than accepting things as they are, the world needs to be improved as much as possible.*
- It's usually better to accept a situation than try to change it.
- Most situations in life need to be improved, not accepted.*

Beautiful vs. ugly
- Nearly everything in the world is beautiful.[GE]
- Though some things are incredibly beautiful, they're few and far between.*[GE]
- There is beauty everywhere, no matter where we look.[GE]
- In life, there's way more beauty than ugliness.[GE]

Changing vs. static
- Everything feels like it's shifting and changing.
- Everything feels like it's constantly moving, changing, and up in the air.
- Everything feels like a whirl of constant change.
- I feel like everything changes all the time.
- The world is a place where most things stay pretty much the same.*

Cooperative vs. competitive
- Instead of being cooperative, life is a brutal contest where you got to do whatever it takes to survive.*[GS]
- For all life—from the smallest organisms, to plants, animals, and for people too—everything is a cut-throat competition.*[GS]
- Instead of being cooperative, the world is a cut-throat and competitive place.*[GS]
- The world runs on trust and cooperation way more than suspicion and competition.[GS]

Funny vs. not funny
- The world is hilarious; if we aren't laughing, we aren't paying attention.[GE]
- Laughing a ton makes sense because life is hilarious and humor is everywhere.[GE]
- While some things are humorous, most of the time the world is not that funny.*[G]
- There's humor in everything.[GE]

Harmless vs. dangerous
- On the whole, the world is a safe place.[GS]
- Real danger is everywhere; even if we don't notice it.*[GS]
- Most things and situations are harmless and totally safe.[GS]
- I tend to see the world as pretty safe.[GS]
- On the whole, the world is a dangerous place.*[GS]

Hierarchical vs. nonhierarchical
- Most things can be organized into hierarchies, rankings, or pecking orders that reflect true differences among things.
- Humans, animals, plants, and pretty much everything else can be organized by how important or good they are.
- Most things aren't better or worse. It's hard to organize the world into hierarchies, rankings, or pecking orders that reflect true differences.*
- Most things in the world could be ranked in order of importance.
- Things are rarely equal. Most plants and animals, and even people, are better or worse than one another.

Improvable vs. too hard to improve
- It's possible to significantly improve basically anything encountered in life.[G]
- Most situations seem really difficult if not impossible to improve.*[G]
- No matter who you are, you can significantly improve the world you live in.[GE]
- In most situations, making things way better is absolutely possible.[GE]
- Most things and situations are responsive, workable, and totally possible to improve.[GE]

Intentional vs. unintentional
- Events happen according to a broader purpose.[A]
- What happens in the world is meant to happen.[A]
- Everything happens for a reason and on purpose.[A]
- Events seem to lack any cosmic or bigger purpose.*[A]
- The universe doesn't care if events happen one way or another.*[A]

Interconnected vs. atomistic
- Every single thing is connected to everything else.
- Most things are basically unconnected and independent from each other.*
- Though things can appear separate and independent, they really aren't. Instead, all is one.
- The world is a place where everything is completely interconnected.

Interesting vs. boring
- The world is a somewhat dull place where plenty of things are not that interesting.*[GE]
- Most things in life are kind of boring.*[GE]
- It feels like interesting and exciting things surround us all the time.[GE]
- While some things are interesting, most things are pretty dull.*[GE]

Just vs. unjust
- On the whole, the world is a place where we get what we deserve.[G]
- Life will find ways to reward those who do good and punish those who do bad.[GA]
- The world is a place where working hard and being nice pays off.[GS]
- If someone is generous and kind, the world will be kind back.[GS]
- The world is a place where we rarely deserve what we get.*[GS]

Meaningful vs. meaningless
- The world is a place where most everything matters.[GE]
- Nothing really matters all that much.*[GE]
- Most things are pointless and meaningless.*[GE]
- The world is a place where things just don't matter.*[GE]

Needs Me vs. doesn't need me
- The universe needs me for something important.[GA]
- Life has an important part for me to play.[GA]
- It feels like the world doesn't really need me for anything.*[GA]
- The world needs me and my efforts.[GA]

Pleasurable vs. miserable
- Life offers more pain than pleasure.*[GS]
- On the whole, the world is a good place.[GS]
- Life in this world is usually pain and suffering.*[GS]
- Life offers way more pleasure than pain.[GS]
- Most things in the world are good.[GS]

Table 4 (*continued*)

Progressing vs. declining
- On the whole, the world is getting worse.*[GS]
- It feels like the world is going downhill.*[GS]
- Though the world has problems, on the whole things are definitely improving.[GS]
- It feels like the world is getting better and better.[GS]

Regenerative vs. degenerative
- Though sometimes situations get worse, usually they get better.[GS]
- Most things have a habit of getting worse.*[GS]
- The usual tendency of most things and situations is to get better, not worse.[GS]
- Over time, most situations naturally tend to get worse, not better.*[GS]

Stable vs. fragile
- The world is a place where things are fragile and easily ruined.*[GS]
- It takes a lot for things to fall apart.[GS]
- Most things and situations are delicate and easily destroyed.*[GS]
- Most situations are delicate. Though they may be fine now, things could easily unravel.*[GS]

Understandable vs. too hard to understand
- Most everything is easy enough to understand.[G]
- The world is a confusing place where many skills and subjects are too hard to figure out.*[G]
- Lots of things in the world are too confusing and difficult to understand.*[G]
- The world is easy enough to understand.[G]

Worth Exploring vs. not worth exploring
- I feel everything is worth trying, learning about, or exploring further.[GE]
- To be honest, though some things are worth trying and exploring, most things aren't.*[GE]
- Everything deserves to be explored.[GE]
- Unfamiliar things and places are usually worth trying or checking out.[GE]

Enticing additional items
- No matter where we are or what the topic might be, the world is fascinating.[GE]
- No matter where we are, incredible beauty is always around us.[GE]

Good additional item
- On the whole, the world is an uncomfortable and unpleasant place.*[G]

Note.
[G] 71 *Good* items. [S] 29 *Safe* items. [E] 28 *Enticing* items. [A] 14 *Alive* items. * 39 reverse-scored items.

Debriefing Form

Project Overview:

The project aims to explore the relationship between interoception (detection of emotional and bodily signal changes) and primal world beliefs (our perception of the world), both of which have been linked to post-trauma emotional regulation and mental well-being. Establishing this connection could provide new insights into the role of bodily sensations in shaping cognitive and phenomenological experiences.

Based on past research, we hypothesise that interoceptive ability is positively correlated with beliefs in the world being 'alive,' 'understandable,' and 'hierarchical'.

Status of the Study:

Data collection for this study is ongoing, to protect the validity of our data, please refrain from sharing specific details about the study to future potential participants. Feel free to use non-descriptive phrases like “it was interesting”. Thank you.

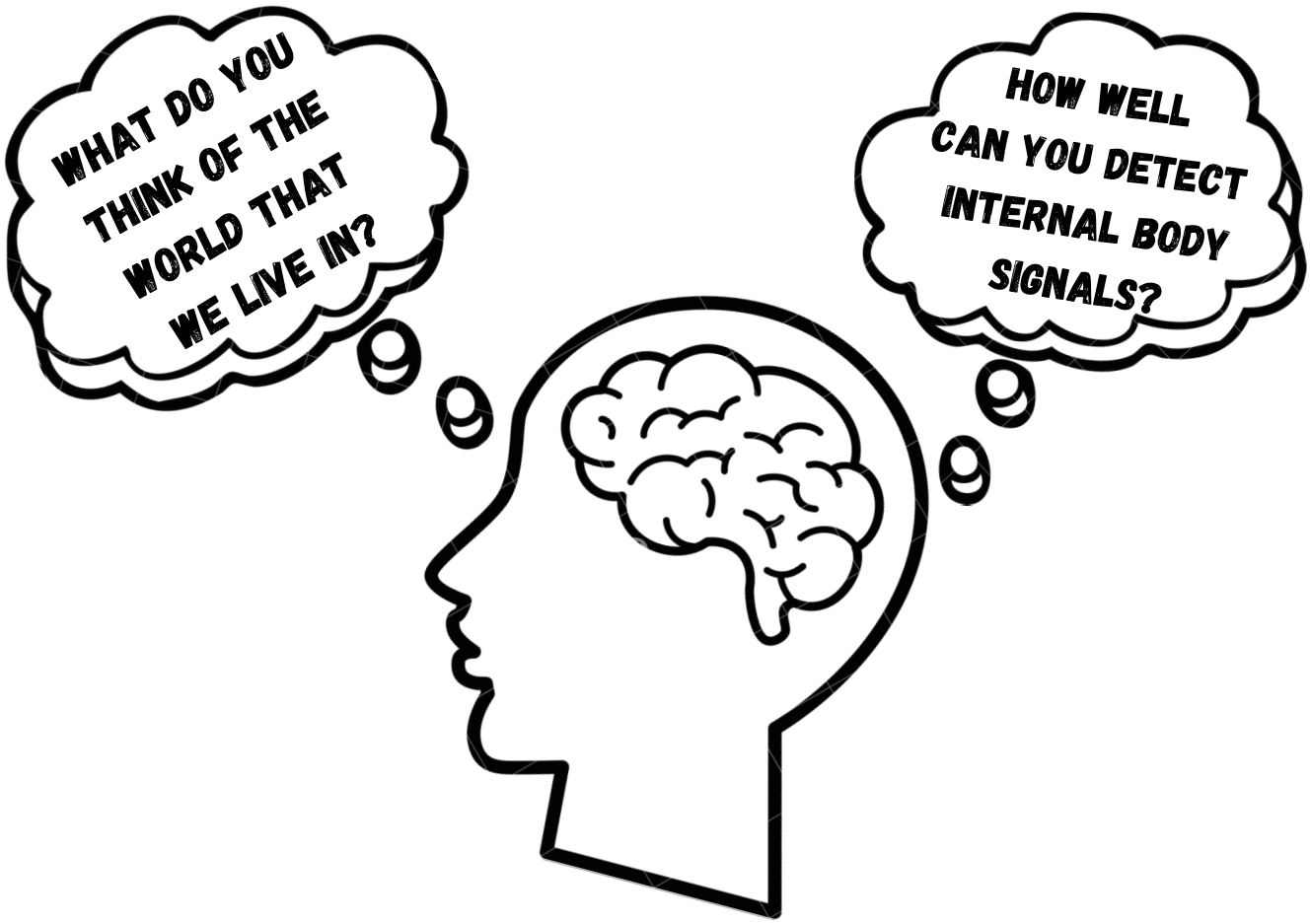
Contact Information:

If you have any questions or wish to receive the study results in the future, please contact us at jx205@sussex.ac.uk

Thank you for your time and contribution to our research. Your help was really appreciated.

Exploring the Mind:

What Is Your Relationship With Your Heart?



Join the study to help us unlock
the mysteries of the intimate connection
between the body and the brain!

US
UNIVERSITY OF SUSSEX

For more detail, please
contact **jx205@sussex.ac.uk** or
scan the QR code to participate

Ethical Review Application (ER/ASF25/2) Ana Ferreira Neves	
Project Title	Exploring the link between Interoception and Primal World Beliefs
Status	Approved
Email	asf25@sussex.ac.uk
Phone No.	
Applicant Status	PG (Taught)
Department	Psychology
Supervisor	Makowski, Dominique
Project Start Date	17-Oct-2023
Project End Date	30-Aug-2024
External Funding in place	No
External Collaborators	No
Funder/Project Title	
Name of Funder	

Ethical Review Application ER/ASF25/2 (continued)

Project Description

This proposal is an exact replication of a previous project (with an ethical review ER/JX205/1 approved on 29-Jun-2023) to continue collecting data.

Only one change was added to the previously approved project, namely the measure of EEG using the Muse 2 Headset. This headset is a commercially available werable advice designed to be easy to use by non-experts.More details about the procedure are available in the attached pfd named Muse2, as well as in the following link:
https://github.com/RealityBending/SussexPhysioProtocol/blob/main/EEG.md#equipment-details

This study aims to investigate the link between Primal World Beliefs and Interoception. Participants will undertake, in one sitting, different tasks (resting and interoceptive tasks) as well as questionnaires. The interoception tasks, will provide objective measures of interoceptive abilities, which include the tapping task (TAP) and the heartbeat counting task (HCT; Schandry, 1981). The questionnaires will provide subjective measures of interoceptive abilities: the Interoceptive Accuracy Scale (IAS; Murphy et al., 2020), the Multidimensional Assessment of Interoceptive Awareness second version (MAIA-2, Mehling et al., 2018) and the Primal Inventory 99 (PI-99, Clifton et al., 2019).

Firstly, participants will undergo a resting state where they will be instructed to close their eyes for 8-minutes, and then asked to fill a resting state assessment (Diaz et al., 2014). After completion of this task, participants will be divided into two groups. Those with odd-numbered IDs (1,3,5…) will begin with the objective measures of interoceptive ability - the TAP and HCT. These tasks will be followed by the IAS, MAIA-2, and PI-99 in random order. Participants with even-numbered IDs (2,4,6..) will start with the subjective measures of interoceptive ability, namely the IAS, MAIA-2, and the PI-99; followed by the TAP and HCT. This aims to minimise any potential impact of the questionnaires on the performance of the tasks, and vice versa; for example, participants that respond to the questionnaires first and self-rating as good detectors might perform differently on the subsequent heartbeat tasks. Therefore, the overall outcomes are better understood by observing the possible effect of controlling the task order.

Ethical Review Form Section A (ER/ASF25/2)	
Question	**Response**
>> Checklist	
A1. Will your study involve participants who are currently or potentially vulnerable or unable to give informed consent or in a dependent position (e.g. people under 18, people with learning difficulties, over-researched groups or people in care facilities)?	No
A2. Will participants be required to take part in the study without their consent or knowledge at the time (e.g. covert observation of people in non-public places), and / or will deception of any sort be used? Please refer to the British Psychological Society Code of Ethics and Conduct (or similar guidelines) for further information.	No
A3. Unless specifically and clearly consented (e.g. a media release form), will it be possible, through a research output, to identify participants in any way? (This does not include taking email details for participant prize draws or identifying participants from signed consent forms or holding identity encryption spreadsheets that are stored securely separate from the research data).	No
A4. Might the study induce psychological stress or anxiety, or produce humiliation or cause harm or negative consequences beyond the risks likely to be encountered in the everyday life of the participants?	No
A5. Is there a risk that the research topic might lead to disclosures from the participant concerning their beliefs, involvement in illegal actions or any other activities that may represent a threat to themselves or others?	No
A6. Will the study involve collecting any personal special category information* in a form that could allow the participant/ participants to be identified? [* identifiers relating to race, ethnic origin, politics, religion, trade union membership, philosophical beliefs, genetics, biometrics, health, sex life or sexual orientation]	No
A7. Will any drugs, placebos or other substances (such as food substances or vitamins) be administered as part of this study and will any invasive or potentially harmful procedures of any kind will be used?	No
A8. Will your project involve working with any substances and / or equipment which may be considered hazardous?	No
A9. Will your study involve the taking and/or storage of human tissue that falls under the Human Tissue Act (HTA)? http://www.sussex.ac.uk/staff/research/governance/erp_overview/humantissue	No
>> Risk Assessment	
A10. If you have answered Yes to ANY of the above questions, your application may be considered as HIGH risk. If, however you wish to make a case that your application should be considered as LOW risk please enter the reasons here. Researchers should note that SREOs or C-RECs may decide NOT to agree with the case that you have made.	

Ethical Review Form Section B (ER/ASF25/2)	
Question	**Response**
>> Data Collection and Analysis (Please provide full details)	
B1. PARTICIPANTS: How many people do you envisage will participate, who are they, and how will they be selected?	We will attempt to recruit 100 participants. Participants will be adults from the student population.
B2. RECRUITMENT: How will participants be approached and recruited?	Recruitment will be done via social media and recruitment posters.It is possible to participate by scanning the QR code on the poster to book a time and date or by contacting the researcher's university email address directly.

B3. METHOD: What research method(s) do you plan to use; e.g. interview, questionnaire/self-completion questionnaire, field observation, audio/audio-visual recording?	Firstly, participants will complete a resting state task for 8-minutes. Then depending on their ID number, they will either perform the self-completion questionnaires first and then the tasks, or vice versa. The TAP task will asks participants to tap the spacebar at different rhythms, this provides a measure of beat-to-tap consistency by matching each tap to the nearest heartbeat to calculate the time difference in between. The HCT task will ask participants to count the number of heartbeats that occur during a specific period, which will then be compared to participants actual number of heartbeats. Bayesian correlation tests will be conducted to analyse the relationship between each interoceptive features and primal beliefs. During the tasks, physiological data, including cardiac activity and EEG data. Cardiac activity will be collected through a BITalino device via ECG, with disposable electrodes (PluX biosignals brand, https://www.pluxbiosignals.com/collections/electrodes/products/gelled-self-adhesive-disposable-ag-agcl-electrodes-pack-of-200) placed on the collarbones and above the hipbone (or PPG a fingertip sensor if the former is impossible), which are non-invasive surface physiological measures. The researchers will receive the proper training to handle the equipment as well as ensure participants' comfort and safety during the setup and recording. Electroencephalography (EEG) will be conducted using the Muse 2 headset, a lightweight and non-intrusive device. The headset is designed to be worn comfortably behind the ears and on the forehead, utilizing four electrodes to capture electrical signals from the brain's temporal and frontal lobes. Specifically, the four channels (TP9, TP19, AF7, and AF8) will be recorded using dry electrodes placed at these sites.Although this headset is commercially available for meditation purposes, it will be used exclusively for research in our study. We will recomend participants to hear a headband to ensure unobstructed contact between the electrodes and their skin. EEG will be used to measure heartbeat evoked potentials. Participants will be instructed beforehand about the setup (the fact that electrodes will be placed on their collarbones and above the hip) and to wear loose and comfortable clothes. Upon placement of the first electrode, researchers will ask and look up for signs of potential allergic reaction (redness and discomfort), in which case the device will be removed, and alternative measures will be done (pulse via finger-tip PPG).
B4. LOCATION: Where will the project be carried out e.g. public place, in researcher's office, in private office at organisation?	Upon signing up for the study, participants will be invited to come to the Psychophysiology lab to complete the experiment.
B5. PARTICIPANT WELLBEING: Will the study involve engaging participants in the discussion of potentially distressing or sensitive topics? (e.g. sexual activity, drug use, ethnicity, political behaviour, potentially illegal activities). If so, please set out how you will manage the well-being of participants.	No.
>> Confidentiality and Anonymity	

B6. Will questionnaires be completed anonymously and returned indirectly?	Yes
B7. Will research data only be identifiable by a unique identifier (e.g. code/pseudonym)? If Yes, please explain how this will be attributed in B11a below.	Yes
B8. Will lists of identity numbers or pseudonyms linked to names and/or addresses be stored securely and separately from the research data? If Yes, explain how this will occur in B11a below.	No
B9. Will all place names and institutions which could lead to the identification of individuals or organisations be changed unless this is consented to explicitly in the consent form?	Yes
B10. Will all personal information gathered be treated in strict confidence and never disclosed to any third parties?	Yes
B11. Can you confirm that your research records will be held in accordance with data protection regulations? (http://www.sussex.ac.uk/ogs/policies/information/dpa)	Yes
B11a. Please explain how ANY identifiable personal and/or research data will be managed and securely stored ensuring that participants have given appropriate informed consent for this.	All data will be used for nothing other than the explicit purpose of our study. Since participants need to enter their names to sign the information and consent form, the names and participant IDs we assigned will be stored in an Excel document protected by password, in case they want to withdraw their data. We will record behavioral data, 4 EEG channels (used for heartbeat evoked potentials), physiological measures (ECG, PPG, RSP) - used in the physiological tasks - and accelerometer data (used to identify noisy data segments).Raw data will be stored in a box folder accessible only to the PI and researchers.
B12. Do you intend to use the research data for any purpose other than that for which consent is explicitly given? If so, please explain below	No
B12a. If you answered NO to any of the above in this section (or think more information could be useful to the reviewer) please explain here:	The anonymized and unidentified data will be made available open-access on OpenNeuro after the experiment completion.
>> Informed Consent and Recruitment of Participants	
B13. Will all respondents be given an Information Sheet and be given adequate time to read it before being asked to agree to participate?	Yes
B14. Will all participants taking part in an interview, focus group, observation (or other activity which is not questionnaire based) be asked to sign a consent form? If you are obtaining consent another way (such as verbally), please explain under B17 below.	Yes

B15. Will all participants self-completing a questionnaire be asked to show consent to participate by a specific and identifiable action? (Give details in B17 below)	Yes
B16. Will all participants be told that they can withdraw their participation at any time during the research and can ask for their data to be destroyed and/or removed from the project until it is no longer practical to do so?	Yes
B17. If you answered NO to any of the above in this section (or think more information will be useful to the reviewer) please explain here:	
>> Context	
B18. Is DBS (Disclosure and Barring Service) clearance necessary for this project? If yes, please ensure you complete the next question.	No
B19. Are any other ethical clearances or permissions (internal or external) required? Please see the help text (i) for further details.	No
B19a. If yes, please give further details including the name and address of the organisation. If other ethical approval has already been received please attach evidence of approval, otherwise you will need to supply it when ready. (You do not need to provide evidence of a current DBS check at this point).	
B20. Does the research involve any fieldwork - Overseas or in the UK?	No
B20a. If yes, where will the fieldwork take place? If undertaken overseas you must attach an OTSSRA form. In the event that the Foreign and Commonwealth Office has specific travel warnings in place for the country (ies) to be visited you will also need to provide a detailed risk assessment. https://www.gov.uk/foreign-travel-advice	
B21. Will any researchers be in a lone working situation?	Yes
B21a. If yes, briefly describe the location, time of day and duration of the lone working. What precautionary measures will be taken to ensure safety of the researcher(s)?	The location of the experiment will be at Psychophysiology lab, during working university hours. The whole procedure should not take any longer than 1h30 minutes from start to finish. This is not antecipated to carry any risks.
>> Any further concerns	
B22. Are there any other ethical considerations relating to your project which have not been covered above?	No
B22a. If yes, please explain:	For this project, we will follow all manufacturer guidelines when using the Muse 2 headband. More can be found on the Muse.pdf.

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 (HCT, 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). 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. One final trial will instruct participants to tap arhytmically.

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 HCT. 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 HCT. 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.

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 (https://sample-size.net/) 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 1. A rating of 0 corresponded to 'strongly disagree,' while a rating of 1 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 1. On this scale, a rating of 0 represented 'never,' while a rating of 1 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 1. A rating of 0 corresponded to 'strongly disagree,' while a rating of 1 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 HCT, 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.

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 features 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

UNIVERSITY OF SUSSEX

Sciences & Technology C-REC
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Certificate of Approval

Reference Number	ER/MP667/2
Title Of Project	Exploring the link between Interoception and Primal Beliefs
Principal Investigator (PI):	Magdalena Pfaff
Student	Magdalena Pfaff
Collaborators	
Duration Of Approval	2 months
Expected Start Date	01-Feb-2024
Date Of Approval	01-Feb-2024
Approval Expiry Date	30-Apr-2024
Approved By	Vacancy
Name of Authorised Signatory	Dr Pablo Romero Sanchiz
Date	01-Feb-2024

*NB. If the actual project start date is delayed beyond 12 months of the expected start date, this Certificate of Approval will lapse and the project will need to be reviewed again to take account of changed circumstances such as legislation, sponsor requirements and University procedures.

Please note and follow the requirements for approved submissions:

Amendments to protocol

* Any changes or amendments to approved protocols must be submitted to the C-REC for authorisation prior to implementation.

Feedback regarding the status and conduct of approved projects

* Any incidents with ethical implications that occur during the implementation of the project must be reported immediately to the Chair of the C-REC.

Feedback regarding any adverse(1) and unexpected events(2)

* Any adverse (undesirable and unintended) and unexpected events that occur during the implementation of the project must be reported to the Chair of the Science and Technology C-REC. In the event of a serious adverse event, research must be stopped immediately and the Chair alerted within 24 hours of the occurrence.

Monitoring of Approved studies

The University may undertake periodic monitoring of approved studies. Researchers will be requested to report on the outcomes of research activity in relation to approvals that were granted (full applications and amendments).

Research Standards

Failure to conduct University research in alignment with the Code of Practice for Research may be investigated under the Procedure for the Investigation of Allegations of Misconduct in Research or other appropriate internal mechanisms (3). Any queries can be addressed to the Research Governance Office: rgoffice@sussex.ac.uk

(1) An "adverse event" is one that occurs during the course of a research protocol that either causes physical or psychological harm, or increases the risk of physical or psychological harm, or results in a loss of privacy and/or confidentiality to research participant or others.

(2) An "unexpected event" is an occurrence or situation during the course of a research project that was a) harmful to a participant taking part in the research, or b) increased the probability of harm to participants taking part in the research.

(3) http://www.sussex.ac.uk/staff/research/rqi/policy/research-policy