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INFORMATION SHEET FOR PARTICIPANTS

Ethical Clearance Reference Number: MOD-22/23-17983

Effects of acute tryptophan loading and depletion on attention and impulsivity in ADHD

I would like to invite you to participate in this study in the Department of Psychology at King's College London. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information.

Principal Investigator: Dr Eleanor Dommett – Eleanor.Dommett@kcl.ac.uk

What is the purpose of the study?

Attention Deficit Hyperactivity Disorder (ADHD) affects 2.5-5.2% of adults and is associated with reduced attention, high levels of impulsivity, and hyperactivity. Adult ADHD is normally treated with psychostimulant medications (e.g. Ritalin or Adderall), which mainly act on the brain chemicals dopamine and noradrenaline, but there are concerns about side effects, potentially abusing these medications and how efficient they are. It is therefore important to consider other treatment alternatives.

Studies with humans and animals suggest that other brain chemicals might be involved in ADHD, particularly the brain chemical serotonin. Interestingly, some ingredients from our diets can impact the serotonin levels in our brains. Tryptophan (TRP) is an essential amino acid that precedes serotonin, which in turn can impact our thinking and behaviour. TRP can ordinarily be taken from our diets. Lower levels of TRP have been associated with ADHD-like symptoms, meaning that increasing tryptophan might offer a new standalone or add-on treatment in ADHD.

To date, only a few studies have investigated tryptophan modulation in adults with ADHD. However, these studies have not focused on core symptoms, meaning that there is little to no research on the main cognitive symptoms of ADHD. Based on this, the aim of the current study is to investigate the effects of moderating tryptophan levels on attention and impulsivity in healthy and ADHD participants. To achieve this, we will assess the impact of tryptophan loading (consuming more TRP than usual) and depletion (consuming less TRP than usual), as compared to a balanced (consuming TRP as usual) condition on key cognitive ADHD symptoms in:

a) healthy adult volunteers;
b) unmedicated adults with a formal diagnosis of ADHD;
c) medicated adults with a formal diagnosis of ADHD.

Why have I been invited to take part?

You are being invited to participate in this study because you are aged 18-35 years and you:

- do not have any gluten or lactose intolerance;

- do not have any current or past nutritional, neurological or psychiatric conditions (except ADHD for this group);
- are not pregnant/breastfeeding;
- are not a smoker (including e-cigarettes);
- are not currently taking medication known to affect the serotonergic system such as antidepressants;
- do not have any learning disabilities;
- do not follow a restrictive diet (e.g. keto).

To confirm this, we will ask you to complete a brief online survey.

What will happen if I take part?

If you choose to take part in the study, we will send you a brief online survey to complete which should take around 10 mins to complete.

You will first be presented with information about the study, which you can read at your own pace, and then asked if you have understood this information and consent to participating. If you have decided to give consent, you will then be required to complete a short screening survey about:

1) yourself (age, gender, ethnicity, handedness and years in education)
2) food intolerances (to confirm that you are not intolerant to gluten or lactose) and special diets
3) ADHD diagnosis (present/absent) followed by a short questionnaire measuring ADHD-like behaviours
4) any medication prescribed for ADHD, if applicable to you (dose, duration of use, type used, adherence)
5) your e-mail address, so that we can contact you to arrange a lab visit, if you are eligible

Following the screening survey, if eligible, we will contact you to arrange a lab visit. Please note that, if invited to attend the testing session, you will be asked to abstain from consuming protein (i.e. meat, fish, dairy, eggs, soya) after 8pm the night before testing and on the day of testing. You will be advised to have a carbohydrate-rich breakfast on the day of testing instead (e.g. bread and jam/cereals). This is because protein consumption can interfere with tryptophan absorption.

Please note that neither the researcher collecting data, nor the participants will know which drink is being administered to minimise the risk of bias (i.e. acting differently during the testing session whilst interacting with participants as a researcher or acting differently during testing as a participant) and ensure scientific rigour.

The testing session takes approximately 2 hours to completed and where you will be asked to complete some computerised cognitive tests before and after a low TRP protein drink, a high TRP protein drink or control condition. All tests are established and well-validated and we currently run them in our laboratory. Brief descriptions of the tests are given below:

1. Attention will be measured with a test that takes around 15 mins to complete. You will be required to press a letter on a keyboard to respond to a target (or 'Go') stimulus whilst inhibiting responses to nontarget ('No-Go') stimuli.
2. Impulsivity will be measured using two tests. In the *first test* you will be asked to make choices, using keyboard presses, between hypothetical rewards now or at a point in the future for several different delays (e.g. 1 week, 2 weeks, 1 month, 3 months, 6 months,1 year). In the *second test* you will be shown 4 decks of cards (labelled A, B, C, and D). Each time you choose a card from a deck you will win or lose virtual money. Both tests should take around 15-20 mins to complete.

Following completion of the second round of tests, your participation in the study will have ended and you will be debriefed.

Remote data collection

In case of remote data collection, eligible participants will be required to be available for an online testing session which can be done remotely. Testing should take around 2 hours and will take place via the online testing platform, Gorilla, and will also involve a Skype briefing and debriefing at the beginning and end of the allocated time slot. A researcher will ask you to prepare and ingest a drink from a sachet (by adding water), which will be send to you in advance of your online testing appointment.

Do I have to take part?

Participation is completely voluntary. You should only take part if you want to and choosing not to take part will not disadvantage you in anyway. Once you have read the information sheet, please contact us if you have any questions that will help you make a decision about taking part. If you decide to take part, we will ask you to complete an online consent form before beginning the online screening survey.

Incentives

Participants who attend and complete the laboratory testing session will receive a £20 Amazon voucher as a 'thank you' for participating.

What are the possible risks of taking part?

In the online survey we will be asking about symptoms of ADHD and use of medication, where appropriate. If you find talking about these topics distressing, you may prefer not to take part in this study.

If attending the laboratory testing session, you will be asked to ingest a protein drink. This drink might contain gluten and lactose, therefore individuals with intolerance to these substances are not eligible to participate. However, some people are not aware they have mild food intolerances and might experience minor discomfort (such as bloating) after ingesting protein powder. We will ensure that the protein powder that we use (protein isolate instead of protein concentrate) contains minimal amount of these substances.

What are the possible benefits of taking part?

The data collected will provide valuable information about the effects of tryptophan on attention and impulsivity in healthy people and those with ADHD. It is anticipated that the study will provide useful findings about the viability of tryptophan as a standalone or adjunct treatment in ADHD and, therefore, has the potential to be beneficial to individuals diagnosed with the condition in the future.

There are no direct benefits to participants for being part of this study, although those who attend and complete the testing session will receive a £20 Amazon voucher as a 'thank you'.

Data handling and confidentiality

Your data will be processed in accordance with the General Data Protection Regulation 2018 (GDPR).

- On receipt of screening survey data, email addresses will be removed from the dataset and replaced with a participant ID, meaning screening data will be stored anonymously. This ID will then be used for all data collected. Email addresses will be stored separately to allow participants to be contacted for booking in testing times. During the study all data will be stored on secure university servers, accessible to only the research team.
- At the end of the study, email addresses will be deleted, and fully anonymised data will be stored on the university servers for up to five years after publication of the work, accessible only to the researchers. Should a suitable online data repository be available, a full set of anonymised data will be placed on the platform to allow future accessibility.
- Participants will not be identifiable from any outputs of the project (e.g. report).

Data Protection Statement

The data controller for this project will be King's College London (KCL). The University will process your personal data for the purpose of the research outlined above. The legal basis for processing your personal data for research purposes under GDPR is a 'task in the public interest' You can provide your consent for the use of your personal data in this study by completing the consent form that has been provided to you.

You have the right to access information held about you. Your right of access can be exercised in accordance with the General Data Protection Regulation. You also have other rights including rights of correction, erasure, objection, and data portability. Questions, comments and requests about your personal data can also be sent to the King's College London Data Protection Officer Mr Albert Chan info-compliance@kcl.ac.uk. If you wish to lodge a complaint with the Information Commissioner's Office, please visit www.ico.org.uk.

What if I change my mind about taking part?

You are free to withdraw at any point of the study, without having to give a reason. Withdrawing from the study will not affect you in any way.

You are able to withdraw your data up to a month after completion of testing, after which your anonymised data will have been included in analyses and interim reports. If you choose to withdraw from the study, we will not retain the information you have given thus far.

How is the project being funded?

This project is being conducted as part of internal research projects and we are not in receipt of any external funding for this work.

What will happen to the results of the study?

The results of the study will be summarised in several different outputs including student dissertations, peer-reviewed journals and presentations. You are welcome to have a copy of any final report or publication. Please tell the researchers if you would like this. As indicated above fully anonymised dataset may be placed on a suitable public data repository.

Who should I contact for further information?

If you have any questions or require more information about this study, please contact the Principal Investigator on this study using the following contact details:

Dr Eleanor Dommett
Department of Psychology, Institute of Psychiatry, Psychology and Neuroscience,
2.13 Addison House,
Guy's Campus, Kings College London,
SE1 1UL

Telephone: 0207 848 6928
Email: Eleanor.Dommett@kcl.ac.uk

What if I have further questions, or if something goes wrong?

If this study has harmed you in any way or if you wish to make a complaint about the conduct of the study you can contact King's College London using the details below for further advice and information:

The Chair, Nursing and Midwifery Research Ethics Subcommittee
rec@kcl.ac.uk

Thank you for reading this information sheet and for considering taking part in this research.