

Interoceptive Awareness Opportunities during Outdoor Education: Developing an Adventure Therapy programme for children with a history of complex trauma Study 1: Feasibility trial at Afon Goch Children's Homes Ltd.

Supervised by: Dr Lara Maister, Dr Jamie McDonald, Dr Andy Cooke, Dr Germano Gallicchio, Kevin Williams, Dr Dawn Wimporv

'Interoception' is the internal sense of our bodies and is related to our emotional wellbeing. There are strong links between interoception and mental health.[1] Maladaptive interoception can develop after traumatic life experiences.^[2] Mindful body-based activities and exercise are thought to improve interoception.[3, 4] Interoceptive Awareness Opportunities (IAOs) are child-friendly tasks; designed to guide children's attention to senses in their body during 1:1 Outdoor Education, within their therapeutic residential placement. Instructors have introduced IAOs to consenting children and report that the tasks can be naturally incorporated whilst teaching the activity. IAOs can help hone children's physical and proprioceptive skills within the activity, plus also provides an opportunity to focus on interoceptive sensations in an enjoyable way. Children who avoid traditional therapy and education have engaged positively in IAOs. See below for examples:

The vagus nerve transmits interoceptive information between brain and body

Close your eyes and spin... use the sense of the wind and sun to point to me

> How is your mood and energy after the snack break?

Let's see what breathing rhythm is best for you up this hill... inhale 2 steps exhale 3 steps? In 1 out 2?

> Try slow breaths to feel calm and ready to tackle a scary bit of the climb!

Experiment with what is easiest – inhale at rest before a big 'move' ... or inhale whilst doing the 'move'?

у У	Predictive 'priors' Hyper-precise, over-	Prediction Error	Recommended the coding model of
A	weighted		
	Type 1 trauma	Under- weighted/ insensitive	'Seeding the brain' with Interoceptive accuracy t to interoceptive input.
	PTSD	Under-weighted	Behavioural experiment
	Depression	Under and/or over-weighted	Process aversive interoc error. Mindfulness. Shift observed body state. Ae
A A A A A A A A A A A A A A A A A A A	Type 2 trauma & anxiety	Over-weighted & sensitive	Provide brain with inten mapping of body state. physical sensations that cardiac/respiratory, vest

Study 2: Can attentional focus and exertion affect interoception? Aiming to empirically validate Study 1, recruiting University students and testing out effects of one IAO using well-operationalised variables [11]

Baseline procedures

- **Start of Session 1: preparation** Random assignment to between groups variable: attentional focus
- Interoceptive Awareness **Opportunity (IAO) group**
- Exteroceptive Awareness **Opportunity (EAO) group**
- Measure and calculate:
- Resting heart rate (HR)
- Heart rate reserve (HRR) maximum
- Target Heart Rate (THR) X 2
- Very light: 20% HRR max
- Vigorous: 60% HRR max

Session 1 & 2: baseline measures

- EEG electrodes fitted
- Heartbeat Evoked Potentials (HEP) during attention to heart
- Heartbeat Discrimination Task (HBDT)



References

- Khalsa, S. S., Adolphs, R., Cameron, O. G., Critchley, H. D., Davenport, P. W., Feinstein, J. S., Feusner, J. D., Garfinkel, S. N., Lane, R. D., Mehling, W. E., Meuret, A. E., Nemeroff, C. B., Oppenheimer, S., Petzschner, F. H., Pollatos, O., Rhudy, J. L., Schramm, L. P., Simmons, W. K., Stein, M. B., ... Zucker, N. (2018). Interoception and Mental Health: A Roadmap. Biological Psychiatry: Cognitive Neuroscience and Neuroimaging, 3(6), 501–513. https://doi.org/10.1016/j.bpsc.2017.12.004 Schaan, V. K., Schulz, A., Rubel, J. A., Bernstein, M., Domes, G., Schächinger, H., & Vögele, C. (2019). Childhood Trauma Affects Stress-Related Interoceptive Accuracy. Frontiers in Psychiatry, 10. https://doi.org/10.3389/fpsyt.2019.00750 Silvanto, J., Ainley, V., Farb, N., Mehling, W. E., Daubenmier, J., Price, C. J., Gard, T., Kerr, C., Dunn, B. D., Klein, A. C., & Paulus, M. P. (2015). Interoception, contemplative practice, and health. Front. Psychol, 6, 763. https://doi.org/10.3389/fpsyg.2015.00763 Wallman-Jones, A., Perakakis, P., Tsakiris, M., & Schmidt, M. (2021). Physical activity and interoceptive processing: Theoretical considerations for future research. International Journal of Psychophysiology, 166(December 2020), 38–49. https://doi.org/10.1016/j.ijpsycho.2021.05.002
- Wilkinson, S., Dodgson, G., & Meares, K. (2017). Predictive processing and the varieties of psychological trauma. Frontiers in Psychology, 8(OCT). https://doi.org/10.3389/fpsyg.2017.01840 Kube, T., Berg, M., Kleim, B., & Herzog, P. (2020). Rethinking post-traumatic stress disorder – A predictive processing perspective. Neuroscience and Biobehavioral Reviews, 113(November 2019), 448–460. https://doi.org/10.1016/j.neubiorev.2020.04.014
- Krupnik, V. (2020). Trauma or Drama: A Predictive Processing Perspective on the Continuum of Stress. Frontiers in Psychology, 11. https://doi.org/10.3389/fpsyg.2020.01248 Barrett, L. F., Quigley, K. S., & Hamilton, P. (2017). An active inference theory of allostasis and interoception in depression. https://doi.org/10.1098/rstb.2016.0011 Paulus, M. P., Feinstein, J. S., & Khalsa, S. S. (2019). An Active Inference Approach to Interoceptive Psychopathology. Annual Review of Clinical Psychology, 15, 97–122. https://doi.org/10.1146/annurev-clinpsy-050718-095617 10. Garfinkel, S. N., Manassei, M. F., Hamilton-Fletcher, G., den Bosch, Y. I., Critchley, H. D., & Engels, M. (2016). Interoceptive dimensions across cardiac and respiratory axes. Philosophical Transactions of the Royal Society B: Biological Sciences,
- 371(1708). https://doi.org/10.1098/rstb.2016.0014 11. Coll, M. P., Hobson, H., Bird, G., & Murphy, J. (2021). Systematic review and meta-analysis of the relationship between the heartbeat-evoked potential and interoception. Neuroscience and Biobehavioral Reviews, 122(January), 190–200. https://doi.org/10.1016/j.neubiorev.2020.12.012

erapeutic interventions in a predictive maladaptive interoceptive systems

novel sensation.

training. Discrimination & attentional training Grounding techniques, reorienting to reality. ts. [5, 6, 7]

ceptive sense differently, minimise somatic attention from predicted body state to erobic activity prevents depression. [7, 8, 9]

se novel sensory input, to reset brain's Try new things. Create new associations from are safe and tolerable. Focus on tibular sensations. [9, 10]

Experimental procedures ~ 1 week within-groups Session 2 Cycle ergometer set to 60RPM. Increase load by 25 watts/minute to reach THR Reach THR after approximately 5 – 8 minutes Briefing for next task ~1min **Target HR2 IAO:** Focus on the sense of your pulse in different parts of your body for 20 second intervals (1. chest; 2. hands; 3. feet; 4. head; 5. abdomen; 6. legs) **EAO:** On the computer screen, find and click on the pulsing patch, then count the pulses.

2 of 4 psychometrics (randomised per session): in Emotion Regulation Scale, Adverse Childhood Experiences scale, International Physical Activity Questionnaire (short), Perceived Stress Scale • Post 'intervention' measures at baseline HR • HEP during internal attention to the heart

Book session 2

Borg Rating of Perceived Effort & Multi-dimensional Assessment of Interoceptive Awareness-2