Project Details	
Project Code	NMH27Ba Jacobsen
Title	Stress reactivity and mental health in young people; how do we measure it, and can we fix it when it goes wrong?
Research Theme	Neuroscience & Mental Health
Project Type	Wet lab
Summary	How a person reacts to stressful things in everyday life is known as 'stress reactivity'. This includes how a person reacts in their body, and also in their thoughts and feelings. Young people who have experienced difficult life events often have problems with how they react to everyday stress events as they grow up, which makes them more vulnerable to developing mental health difficulties in adolescence and early adulthood. This project will focus on ways to help young people with their stress reactivity as a preventative strategy to protect against the future development of mental health difficulties.
Description	People commonly encounter minor hassles in their everyday life which cause short-term ups and downs in their mood. For example, when stuck in a traffic jam, a person might react by feeling irritated and annoyed (emotional reaction), their heart might start beating faster (physiological reaction) and they might start beeping their horn (behavioural reaction). This combination of emotional, physiological, and behavioural reactions is known as stress reactivity. A person's emotion regulation system is designed to return to a baseline steady state after a stress reaction leads to increased arousal. This is a bit like an emotional thermostat working to maintain an even emotional temperature. Stress reactivity relies on a complex set of bodily functions involving the neuroendocrine system, which includes specialized cells in the brain which release chemical messengers (hormones) into the blood in response to encountering a stressor in the environment. The two main physiological systems which are activated when a person is exposed to an acute stressor are the sympathoadrenal medullary (SAM) and the hypothalamic-pituitary-adrenal (HPA) axis. Unfortunately, we know that childhood abuse and trauma, can cause damage to these systems in the brain due to chronic over-stimulation. Adverse Childhood Experiences (ACEs) can cause the body's stress systems to malfunction by being either over or under-responsive to stress, meaning that a person's emotional thermostat is not working properly. Dysregulated stress reactivity has been associated with an increased risk of a wide range of mental health difficulties, including depression, anxiety, and psychosis. This is why young people who have experienced abuse or neglect are sometimes referred to as 'At-Risk Youth'. Although there is a well-established link between early trauma exposure and increased risk of mental health problems, to date this knowledge has had limited impact in translating to credible intervention strategies. Focusing on measurement of ACE exposure has substantial margins for error as a predictor of mental health risk, as we know many young people exposed to ACEs do not always later develop mental health problems (resilience). Capturing modifiable, mechanistic candidates potentially offers both more precise identification of At-Risk young

	people and the possibility of shifting mental health trajectories towards a more resilient profile. This proposal would tackle some of the key challenges in progressing this line of work. Firstly, there is no universally accepted 'gold standard' of how to measure stress reactivity, with many existing tools and methods subject to severe limitations in their utility. For example, measuring the hormone cortisol, which is released by the HPA axis as part of the stress response, is commonly done using one-off samples of blood or saliva. However, the functioning of the HPA axis is both rhythmic, in line with the circadian cycle, as well as rapidly responsive to stress, creating a highly dynamic profile. Taking isolated samples means only a crude estimate of these dynamic factors can be measured. Our research group has recently pioneered and piloted novel technology which allow for ambulatory blood-free measurement of cortisol and other biomarkers using microdialysis delivered via a wearable device. This allows people to go about their normal daily activities whilst wearing the device. Using the U-RHYTHM device alongside other stress reactivity measures, using Experience Sampling Methods, will allow us to more accurately model the relationship between stress responses captured at the physiological, psychological and behavioural levels. The first part of the PhD will focus on addressing measurement issues in the field to progress consensus on the most robust and reliable measures to use, leading in the second part to focussed, small-scale piloting of interventions which could potentially modify dysregulated stress responses in At-Risk youth. The key aims of the studentship are:- 1. To investigate novel ways of measuring stress reactivity in At-Risk young people (16-25) by assessing the feasibility of using the U-RHYTHM device to measure ambulatory cortisol in this population 2. To investigate the degree to which different ways of measuring stress reactivity converge or diverge with each other to help better inform how we measure stress reactivity in studies with young people 3. To determine if specific psychological or behavioural interventions could be credibly used to modify dysregulated stress reactivity e.g. exercise, mindfulness Key areas for the student which they would take the lead on steering:- 1. Deciding on the balance between working on how we measure stress reactivity and how we can modify this – it would not have to be an even split in terms of time spend on each stage. 2. Deciding which measures of stress reactivity to focus on, and how to best pilot the use of ambulatory biosampling technology. 3. To review the literature and decide which population to target in their study i.e. community samples, help-seeking samples 4. To review the literature and decide which psychological and/or behavioural interventions to pilot and which setting and population to target
Can be completed part time?	No

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