# Cortisol

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*"Cortisol, cortisol, cortisol"*

A central feature of being autistic for many autistic people is heightened sensory experience. This emerged during the ethnographic research I carried out over the last ten years with autistic people and those they share their lives within the UK and USA. In our interactions, a model of autism was formed around this notion of heightened sensory experience. Ways of being autistic were defined in terms of sensory alterity and relatedly, a "fight or flight" (or stress) response particularly sensitive to neurotypical atmospheres and architectures. Living in worlds lacking affordances for neurodiversity, led to 'overload' and 'meltdown', severe stress and if left unchecked, chronically high cortisol levels. Such states were understood to be ameliorated by regulatory movement practices known by my interlocuters as "stimming" and 'autism friendly' environments.

In 2015/16 I spent 16 months in England, UK and a Southern state of the USA researching a horse-based, autism-specific kind of therapy. This therapeutic milieu was a context where this model was particularly salient. I carried out participant observation and interviews

with therapy practitioners, their autistic clients, parents, carers and teachers, alongside working with young autistic adults learning horse training and care. Amy, an autism therapy practitioner, described the effects of such embodiments of 'overload' and 'meltdown' by dramatically referring to the rapid release of flows of "cortisol, cortisol, cortisol" into the bloodstream. Processes of 'overload', 'meltdown' and the workings of "fight or flight" were commonly described in hormonal terms. However, as I show here, this was not a simple biological reduction of 'autism' to flows in the blood. Hormones were used to articulate cascades of biosocial flows across environments (human and architectural) and embodied living, and a therapeutic ecology of equine therapy. I seek to articulate these uses here.

Cortisol was used to acknowledge a negative spiral of stress (Milton 2013) caused by inhabiting worlds where one's needs are deemed secondary to the dominant majority and therefore unimportant. I explore wider narratives of cortisol and chronic stress in the UK alongside their perceived alleviation through animal-assisted therapies in the context of autistic children and adults. By exploring an autism-specific type of horse-riding therapy I show that increased contemporary fluency with hormone knowledges facilitate a linking of health to particular environments of stress for autistic people. This reflects the ability of cortisol and "fight or flight" to articulate broader concerns around the ecological situatedness of human health.

In her work on hormonal contraceptive use in New Delhi, India, Nayantara Appleton Sheoran (2015) explores differential access to Emergency Contraceptive Pills (ECPs). Wealthy, elite women easily access ECPs within private clinics. Women in the adjacent slums cannot. Sheoran traces a process of what she terms 'stratified contraception'. Here I travel in a similar vein yet expand this notion to non-reproductive and non-synthesised hormones (cortisol, oxytocin). I propose the notion of *hormonal stratification* to encompass processes like stratified

contraception so well-articulated by Sheoran. Yet I depart from a focus on the ingestion of synthesised hormones to which one has stratified access, and instead engage with the stratification of endocrine systems more broadly.

The notion of hormonal stratification encompasses the endogenous hormonal effects of living in environments of inequality. In this chapter, this offers a way to appreciate the biosocial effects of living in neurotypical worlds that create significant amounts of stress for autistic people. Tracing examples of hormonal stratification allows us to see the ways that autistic people and their therapists (and arguably people more broadly) in the UK and USA are currently operationalising endocrinological knowledge - and the stress response system in particular - as a legitimate way of articulating these concerns.

## Situating Autistic Experience

As part of this project, I attended an annual general meeting of a local branch of the National Autistic Society (NAS), a UK-wide autism support organisation. One of my autistic interlocutors, Thomas, was there to present to the group, which consisted predominantly of parents of autistic children or non-autistic providers of care. He eloquently spoke about his experiences of being autistic. His tics and 'stimming',[1] emerged every so often. He brought his hands quickly to his face and made his fingers flicker rapidly in front of his eyes. Sometimes he rapidly shook his head and giggled. This happened mostly when he was pleased or excited about something. He told the crowd "I was diagnosed late. I constantly asked 'why am I different from

the other kids at school? Why do I feel different? Why am I so anxious?" before explaining the significance of sensory experience in his life:

> There's a lot of change just now and people are interested in autism. It's an interesting time to be autistic. But what people need to understand is that nothing changes about your autism from when you are little to when you grow up. The sensory problems and social problems and stimming are all there. You just learn better coping strategies...

Here Thomas signals to the importance of relations with other people in the production of his difficulties at school and with performing as a good student.

For him, being taught by teachers with no understanding of his needs would send him into overload and meltdown.

> At school I struggled. I was given too much information at once. My brain was just like 'arggggghhhh', I can't take any of it in... At school I was trying hard, but I couldn't cope. I was thrown out of school for being autistic. That's why I say, 'I don't have a learning disability, I have an educational problem'.

School was particularly hard for him, yet being outside, in the countryside, caring for his horse furnished him with an environment full of positive embodiments. Commonly described negative "triggers" for sensory overload are supermarkets with their bright lighting, array of smells including synthesised cleaning solutions, echoing atmospheres and large volume of people. Thomas therefore didn't feel that 'autism' was something situated in his brain alone, but in his

relations with the human and built environment. For Thomas being autistic was a condition emerging from his situation within worlds that did not understand him or make affordances for different ways of being. He clearly felt that embodiments of anxiety were caused by sensory and social worlds designed for neurotypical people, and by spaces that took no account of the particular needs of neurodiverse people, especially those with enhanced sensory sensitivities (Malcolm 2021).

As part of the fieldwork, I travelled to a ranch in a Southern state of the USA to trace an autism-specific method of horse therapy back to its source. I took training in the method and was taught that ‘natural’ environments were stress and anxiety relieving and could modulate hormonal flows in the blood. As such the open fields and countryside of the farm-like spaces where horses and other animals were kept, were by design effective in helping to calm sensory overload and meltdown. Part of the method training included guidance on how to enhance these effects, by accessing (or planting) a woodland trail, riding to a river or stream, or by simply adding spaces where engagement with the elements and a range of 'natural' textures could be encouraged (water troughs, sand pits, muddy areas).

By default, the more natural spatial design of the horse farm was a significant part of what made horse therapy in particular so useful for helping ease the chronic stress of autistic people. The trainer reflected significant current focus on the health benefits of ‘nature’ in the UK and USA. They also invoked salient contemporary ideas circulating in the UK about the somatic effects of stress. These models of autistic ways of being speak to very contemporary, widely circulating concerns with chronic stress and the human condition, and more specifically, a perceived bodily incompatibility with the urban, industrial milieu.

## Cortisol Cascades

Hormones act as messengers (Roberts 2007) cascading information around the body and between biological processes. Yet they also effect a cascade of information in the shape of meaning passed between persons. They are a particularly striking example of a material semiotic actor (ibid.). Hormone knowledges have emerged in a range of arenas to articulate the human condition beyond reproduction and now circulate in public narratives as a powerful heuristic for understanding physiological manifestations of social and sensory worlds and states of mind. Oxytocin for bonding, care and love; dopamine for pleasure; cortisol for stress and anxiety. In focus here, and in response to my interlocutors' uptake of the terms and knowledges that surround them, are the flows of cortisol. Despite significant difficulty with studying the role of cortisol in biological processes in the body, these chemicals broadly act as a 'messenger of stress' (Roberts and McWade 2021). Cortisol was central to how horse-therapy practitioners understood the embodied effects of being autistic and inhabiting worlds that do not take differences – in this case autistic sensory and communicative needs - into account.

Like other hormones, cortisol cascades. It does not flow in isolation but rather always in relation to other 'internal' bodily processes and endocrinological flows, and 'external' features of one's environs. Surging cortisol flows in particular were deemed to be the result of living in sensorially stressful worlds, and both the cause and effect of a cyclical, spiralling chronic stress. In this context cortisol sets in train a cascade of information communicating the embodied experience of autism to wider publics, due to the wider salience of cortisol as a carrier of meanings about stress. This action importantly situates the condition 1) beyond the flows of isolated hormones and into the stress response of the body and 2) in environments extending beyond the molecular flows of the individual, human body. This action of cortisol as a carrier of

meaning intimately reflects/echoes its perceived bio-ecological cascades making the 'interior' of the body permeable to 'external' forces. I expand on this below.

## A Therapeutic Ecology: Environments, Limbic Systems and Endocrinological Flows

Paul was the father of an autistic son, and the chairperson of the local branch of a national autism society in the UK. He told me that when living and working with autistic kids and adults it is key to "generate a calm, trusted environment". Thinking about the lived environment and not only the hormonal flows or neurological processes in the individual body was central to engaging sensitively and respectfully with autistic people. Paul spoke to the cascading action of hormones when he told me that by effecting a safe environment "cortisol levels come down. Adrenaline levels come down; noradrenaline levels come down... It takes some kids a while to trust the environment." Paul also noted that "good horse people" (horse trainers) had long-term experience in working sensitively with horses, herd animals that are particularly sensitive to bodily communications. As such they were well placed to engage sensitively, in non-verbal and embodied ways with autistic clients. The human and built environment was intimately linked to the flow of cortisol which was in turn intimately linked to the flows of other hormones.

This cascading was central to the model of autism being promoted in this autism-horse therapy nexus. This kind of embodied hormonal model of autism as something irreducible from one's environs emerged strongly throughout my fieldwork with autistic children and practitioners providing autism-specific horse riding. The method used was 'back riding' where

an instructor sits in the saddle with the child. From this proximity, the instructor can control the horse, keeping the child safe. This means that faster paces can be used than when a child rides alone in the saddle. During my first induction into the activities at the largest riding centre offering back-riding, I was told that the faster pacing of trot and canter (rather than walking), "gets the hips moving which releases the feel-good hormones, oxytocin, serotonin, and reduces cortisol". As I've explored elsewhere (Malcolm 2019, 2021) back-riding was deemed able to modulate the hormonal flows of the body and in a more concentrated way, compounding the benefits of moving through 'natural', calm environment of the riding centres, and engaging with people with sensitive bodily ways of communicating, as described by Paul. Horses therefore became part of the environment, or what I call the 'therapeutic ecology' of horse-assisted therapy (2019, 2021).

Practitioners particularly focused on cortisol's relationship to the flow or blockage of oxytocin, the 'love' or 'bonding hormone'. The two were perceived to exist in proportional balance with one another with horse therapy described by some practitioners as a way of redressing an 'imbalance' of (too little) oxytocin and (too much) cortisol in the blood (Malcolm 2021). We can see that stress and cortisol were central to understanding lived bodies in embodiments of stress, yet never in isolation from related bodily systems, other hormones or environments.

Therapy practitioners' focus on the "fight or flight" response worked to entwine the limbic system, the endocrine system, and the digestive system. Paul's words and allusions to cortisol flows speak to a hormonal model of autism, yet also importantly to a focus on lived experience as something enacted through complex interactions of the entire, situated body. Both of these notions were utilised by the people I got to know to understand autistic ways of being.

Sympathetic and parasympathetic nervous systems (rather than only the central nervous system) were invoked – shifting autism from being perceived as a psychiatric condition of the brain to one enacted via lived, material embodiments.

The articulation of living breathing bodies through the language of hormonal and other systemic bodily flows is of course not limited to these very specific models of the autistic body. Autistic people's ways of articulating their experience are just as deeply situated within contemporary models of the body as those of non-autistic people, despite long-standing and incredibly problematic declarations of autistic people's irreducible isolation from social worlds and environments (see Bettelheim 1969) and ontological positioning as somehow alien to human experience (Hacking 2009). On the contrary, these models of the condition speak to very contemporary concerns with the human condition and chronic stress, and a perceived bodily incompatibility with the urban, industrialised milieu. As Fitzgerald and Rose (2022) detail, these concerns have very long histories.

## Stress, Fight or Flight and the Limbic System

Hormones are increasingly used by a range of publics to articulate bodily inhabitations and are bound up in burgeoning notions of the porosity of the body to its environs. Cortisol, the 'stress hormone', is central to daily bodily functions of waking, yet is deemed to spiral out of control in response to intensely stressful worlds too fast to be kept up with without 'overload' and 'burnout'. In my experiences from fieldwork, and from the popular science media it is evident that cortisol talk almost always involves a mention of or implies the activation of what is known as 'the stress response'. Also referred to as "fight or flight", this process is a function of

the limbic system and endocrine systems of the brain and body respectively. Walter Bradford Cannon (1932) coined the term in his fluid matrix model of the body referring to "fight or flight" as an integral part of 'the wisdom of the body' for its action of returning internal homeostasis, or balance, after the experience of an external threat.

Acting as 'messengers of stress' (Roberts and McWade 2021) cortisol (and the stress response) offer a relevant language to sensitively articulate the lived experience of autistic ways of being in ways that can be understood by non-autistic publics. By actively highlighting, in a culturally salient way, that particular social and built environments affect sensory issues and anxiety for autistic people, these biological articulations can be used to encourage non-autistic people to learn about the experience of being autistic. In so doing, they can make living, breathing somatic affordances for such ontologies, altering what we might call the 'infrastructures of feeling' produced by the social and built environment. The normative force of ideas about hormones that are either balanced (and normal) or imbalanced (and pathological) require critical attention.

This is certainly true in the case of autism where dubious hormonal therapies in the shape of oxytocin nasal sprays and luteinizing hormone-releasing agonists for reducing testosterone are sold as 'treatments'. Yet there exist tensions and ambiguities between the reductive biologisation on one hand, and the disruptive power on the other, of hormone thinking. These ambiguities within the realms of the biosocial require careful unpacking (Mackenzie and Roberts 2017, 137). It is imperative that we remain open to the potential new models of the situated body that hormonal flows offer and what this can tell us about contemporary understandings of situated embodiments in the context of autism and beyond.

In short, the above discussed models of hormones, the limbic system, and their inherent relation to the environment speak to the real-world impacts of living in spaces designed for neurotypical others, as these models become important for autistic people's understandings of their condition as situated in and produced by relations with the world. These considerations acknowledge the role of poverty and social inequalities in the activation of 'fight or flight' otherwise known as 'the stress response' in the context of autism and beyond. They act widely as potential aetiologies for ill-health which problematically molecularise life (Rose 2007) by situating autism in the molecular flows of the biological body. Yet, they also speak to the de-individualisation of conditions like autism (and other groups of people whose quality of life is deemed less important than dominant majorities). That is, they simultaneously alter the site of autism, moving 'it' from pathologised individual bodies to something enacted in the interactions of lived bodies within stressful environments that lack affordances for different ways of being. In new ways then, this quantifies the deleterious effects of for example inhabiting poor housing, insecure work, or continual threats of and experiences of incarceration, discrimination and violence that ultimately emerge from a significant lack of understanding of autistic sensitivities and ways of being.

## Hormonal Stratification and Transcorporeality

Stacy Alaimo (2010) proposes the term transcorporealities to speak to "the imbrication of human bodies, not only to each other, but with non-human creatures and physical landscapes" (15). In her final work, *The Transmission of Affect* (2004) feminist scholar Theresa Brennan (2004, 1) relatedly speaks to the bodily transmissions of feeling. She tells us that the:

> transmission of affect, whether it is grief, anxiety or anger is social and psychological in origin. But the transmission is also responsible for bodily change; some are brief changes, as in a whiff of a room's atmosphere, some more longer lasting. In other words, the transmission of affect, if only for an instant, alters the biochemistry and neurology of the subject.

The "atmosphere" or environment literally gets into the individual. Building on Alaimo's notion of transcorporeality (2010) and Brennan's transmission of affect (2004) we can see that the bodily affects expressed by practitioners speak to a system of biofeedback loops with the bio- referring to a deeply subjective material body and the feedback emerging from the atmosphere of the environment. The notion of, and lived experience of, 'stress' is a central feature of current models of the body, affecting people in variegated and stratified ways; across gender, disability, socioeconomic status, and those who are the subject of racialisation.

Building on earlier work on discourses of race, hypertension and heart disease in the USA, Anne Pollock (2012) explores how racism and discrimination are understood to become embodied through the lens of the hormone angiotensin in her entry in this volume. In her ethnographic work Nayantara Appleton-Sheoran (2015) engages directly with the ways that hormones can enact stratification. She details the differential use of and access to the emergency contraceptive pill (ECP) by women from different castes and socioeconomic backgrounds in Delhi, India. Sheoran builds on Shellee Colen's (1989) invaluable notion of stratified reproduction and delineates women's stratified access to emergency contraception with a focus on 'stratified contraception'.

Here I speak to a broader process of hormonal stratification, beyond reproduction or synthesised hormones, that my interlocutors suggested seeped into their bodies, linking normative architectures, 'natural' green spaces and their accessibility (or lack thereof), the living, breathing effects of discrimination and ultimately (embodied) mental health and illness. In the context of autism and horse therapy in the UK and USA, and arguably more broadly, cortisol and "fight or flight" have become salient mediators of meaning about the lived embodiments of inequalities in the UK and USA and beyond. They facilitate the therapeutic ecology crafted by my interlocutors to understand the real world effects of equine therapy for autistic people.

## Conclusions

Cortisol cascades as a material-semiotic messenger of stress, in the context of autism and horse therapy, and arguably more broadly. In this chapter I have established my interlocutors' understanding of a negative spiral of stress (Milton 2013) caused by inhabiting worlds where one's needs are deemed secondary to the dominant majority and therefore unimportant. I have described particular environments designed to alleviate sensory discomforts through enhancing 'good' sensory triggers, reducing 'bad' sensory triggers, and teaching non-autistic people about autistic modes of communication and sociality as a way to improve 'the human environment'. These can be seen as living affordances for autistic ways of being. This alleviation is perceived to be enacted via engaging in ways attuned to the "fight or flight" response, and transcorporeality (Alaimo 2010) affording the transmission of affect (Brennan 2004) between people (and mammals in general). This model of stress was situated in one's embodied experience of the environment and articulated via a very contemporary fluency with hormone knowledges.

This approach allows us to delve 'in' to the body, illustrating what was understood by my interlocutors to be a deeply enmeshed person-in-action, taking autism beyond the individual body. By engaging with the notion of hormonal stratification produced by particular built and human environments we can see the emergence of hormonal ways of thinking that acknowledge the slow structural violence of living in worlds designed for an assumed neurotypical majority. This reflects broader contemporary concerns around stress in the UK and USA, signalling cortisol's ability to communicate significant disparities in the embodied effects of living as a minority.

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[1] Stimming is a term used by the autism communities to refer to self-stimulatory movement practices, described as practices used for either pleasurable engagement with one's environs, or for soothing anxiety and sensory overload.