Kaleidoscope

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When the next pandemic hits, which lessons will have been learned? I suspect we've warehouses stuffed with toilet rolls and masks; I'm less confident the immediate necessary shut-down of borders and flights will occur. This requires planning now, and writing in the *Lancet*, Kavanagh et al[1] set out the need for new global health agreements. They note current negotiations on a new pandemic treaty and the revision of the International Health Regulations on issues ranging from data and vaccine-sharing to maintaining international law. Their analysis pushes this further, invoking comparisons with areas such as human rights, trade, finance, tobacco and environmental law. Categorising mechanisms of compliance under the groupings of 'police patrol' (a trust-building review mechanism of compliance), 'fire alarm' (search for violations) and 'community organiser' (self-identification of capacity, technical, financial and other gaps that might need assistance), the authors note that only a few of the available potential options are currently being explored. Building on this, they propose six specific mechanisms that they optimistically argue are both politically feasible and able to shift individual state behaviour. Helpfully, these are detailed and measurable. Success clearly hinges on compliance as well as the appropriate regulation, and some of the failures of COVID-19 were due to the former, although the authors emphasise this isn't a binary thing; compliance can be partial, and 'good behaviour' can be induced via various mechanisms. International reputation, a desire for reciprocity, a fear of sanctions, legitimacy and domestic politics all pull positively on nations. Sadly, I fear human nature is such that we will all know what is needed, but an 'except for me and my lot' exceptionalism element risks stalling or undermining necessary cooperation, which may proceed far slower than a virus can spread.

Behaviours that challenge (BtC) are a well-recognised issue for some people with intellectual disabilities and those who care for and work with them. There's been a bit of a dearth of methodologically robust work on the topic given the scale of the subject, albeit it's ethically and practically not a simple thing to evaluate. Nevertheless, guidelines emphasise non-pharmacological approaches, whereas we know that practice shows medications to be ubiquitous, though often off-label. Groves et al[2] systematically reviewed and meta-analysed the data from 82 randomised controlled trials (RCTs) to help inform clinical practice. It's the first such work to take only RCTs, of both medications and non-medications, and so broad a range of what are labelled 'topographies of behaviour'. The findings were a little disappointing insofar as effect sizes were small, and there was little to distinguish non-pharmacological from pharmacological interventions. Overall, this speaks primarily to the issue noted at the start of the piece about the need for more and better (and better powered) data. This is especially true for specificity to particular behaviours rather than BtC more globally. The article certainly does not say interventions do not work or should not be attempted. Equally, however, it does not endorse the too-common practice of inappropriate and evidence-less prescribing that risks harm. In a linked editorial, Angela Hassiotis[3] notes that 'it is likely that the umbrella term of behaviours that challenge has stifled debate and scientific enquiry into how best to support people with intellectual disabilities or autism'. She highlights the challenges specialist services face and how professionals can feel helpless in what to do once several cycles of behavioural approaches have been delivered. Her call reinforcing the need for high-quality research, including the oft-stigmatised pharmacological approaches, is well made.

We need practical interventions that can be easily locally delivered to reduce cardiometabolic disorders in severe mental illness (SMI). We know the disappointing figures, which seem stubbornly stuck and not improving, and we also know the factors that are driving or contributing to the problem. It's a serious healthcare issue and one without much mystery, even if it is often multifactorial with a combination of medication, genetic, lifestyle and environmental factors. A paper in *JAMA Psychiatry*[4] evaluated one such intervention, as part of the SMILE study. In a pragmatic cluster RCT across eight mental healthcare centres with 21 assertive community teams in The Netherlands, 224 patients with SMI and a body mass index of 27 or more received either treatment as usual (TAU) or a weekly 2 h group session over 6 months that was followed by a monthly equivalent for another 6 months. There's some inherent appeal to the nature of this type of group programme, in terms of the demands on service delivery and what might practically be deliverable, and it is modelled on an existing evidence-based programme for older adults. It was individualised to the participant, but the principles included sessions exploring portion sizes; energy balance and goal setting; breakfast, physical activity and regular eating; working a healthy pattern; and environmental and social support. It also had progress checks and problem-solving sessions and explored social issues such as eating out. Those in the active arm lost an average 3.3 kg more than those receiving TAU, with individuals showing higher attendance attaining the best results. Interestingly, over the 12 month period, there were very limited to no changes for the secondary markers of blood pressure, lipid profiles, fasting glucose levels, quality of life, self-management, and changes to lifestyle behaviours that included physical activity and health, mental health, nutrition and sleep. The authors note the challenges of how mean changes in weight often mask subpopulations who do particularly well or badly, and motivation to change is crucial to determine. They also rightly call out how critical surrounding obesogenic environments are, an issue often amplified for those more vulnerable with an SMI.

Dipping in and out of emails during a Teams or Zoom meeting, checking your phone for messages while trying to write slides for a talk – we all do it, and we all suspect it is ultimately inefficient. Come on, science, won't somebody test this? Enter Grahek et al, with a really nice preprint[5] looking at the putative costs of adjusting cognitive control over different tasks and goals. They describe a dynamical systems model for making adjustments in continuous control. This varies between tasks: for example, some can be done quickly and without much attention, but this may come at a price in accuracy, and vice versa. Consider, for example, an email you compose to your boss about an important work request you have, compared with one you fire off to an old colleague confirming going for a beer later (of course, you shouldn't be using work emails for the latter in any case – it's a trick hypothetical, so shame on you if it resonated). The challenge is not so much that different tasks have different inherent cognitive control needs (again, perhaps contrast reading a book, checking Twitter and listening to a conference speaker), it's that hopping between them comes at an inertial adjustment cost. The authors evaluate this in a variation of the Stroop test, in blocks that altered in terms of having fixed or changing performance goals, namely, to complete tasks either quickly or accurately. They found what you've suspected in your heart: jumping between different task types, especially without much time to adjust, comes at a performance cost, and the more often you do it, the greater the impedance. The work is clever in that it shows how this occurs, as explained by their model. Task

switching is part of life: it's necessary and important, and your brain can deal with it. However, it comes at a price. So, here is science saying: put down your bloody phone when you're trying to do something else, and close off your emails when you need to focus on a meeting. You are *not* being efficient, you're doing the opposite. Allocate set times for those tasks. Or at least don't try kid yourself that you're being efficient when you mix it up.

Neuromodulation started with electroconvulsive therapy, and in recent decades, repetitive transcranial stimulation (rTMS) and transcranial direct current stimulation (tDCS) have been added to the repertoire. Enter a new challenger: transcranial-focused ultrasound (TUS). For the psychiatrists in the room, ultrasound was probably last seen during an obstetrics placement in medical school, and it might seem an unexpected arrival in the neuroscience suite. However, Yaakub et al[6] propose that its ability to mediate neurochemical changes may make it an interesting and novel addition to the neuromodulatory toolkit. I was interested to learn that compared with the more established TMS and tDCS, TUS offers two potential advantages. First, it can target deeper into the brain, hitting subcortical areas as well as the surface cortex. Second, it has better spatial specificity, in the region of millimetres, compared with the centimetres offered by the older techniques, particularly if combined with targeting magnetic resonance imaging. The authors note that depending on the sonication paradigm used, effects can either be limited to 'online' (while the TUS is occurring), or they can be 'offline', that is, persisting, probably owing to a neuroplastic impact on cellular potentiation or depression. In this study, the effects of TUS to the dorsal anterior and posterior cingulate cortices were measured in 24 healthy adults, with a particular emphasis on establishing any changes to neurotransmission. The blinded model included a sham-TUS arm, and magnetic resonance spectroscopy was used to determine *in vivo* levels of gamma-aminobutyric acid (GABA). The data show that a primary effect of TUS is to reduce GABAergic activity, resulting in an overall disinhibitory rise in excitatory neurotransmission, and functional connectivity changes endured for about an hour after simulation. As ever with neuromodulation, moving from laboratory neuroscience to therapeutics is where the (inevitably messier to measure) goal has to be, as well as determining when, where and in whom to apply it.

Finally, Paula Abdul taught us that opposites attract when it comes to relationships, but is it possible she might have been wrong? It's an issue that has been studied by sociologists, anthropologists and psychologists, not to mention poets, philosophers and aunties of the world. Horwitz et al[7] meta-analysed 22 traits reported in just under 200 studies and then tapped the UK Biobank to test this further across an impressive 133 traits in almost 80 000 male-female couples. Before reading the results, check your biases (and your relationship history): what do you think they found? Well, it varied by trait, and for some of these, similarities appeared important, with couples showing strong correlations. For others, it's not so much that Paula was right, but that it appeared less essential for them to be similar. The traits that couples were most likely to share were political and religious attitudinal views, educational attainment (and IQ score) and – perhaps surprisingly – substance use traits. Psychological and anthropometric (body shape) traits appeared less important or at least were less positively correlated: it seems your personality matters less than finding someone who agrees with your perspectives on the current government. There are clearly lots of confounders at play in assortative mating and the phenomenon of phenotypic homogamy ('similar traits attract'): we might like people with shared interests, indirectly we might be more likely to bump into those with such shared interests at common locations, and your parents or well-wishing others may play an interfering/helpful (delete as appropriate) part. Social and genetic homogamy add new layers, as does the issue of convergence where interests can be shared with time, as one partner – to take a highly random example – comes to accept, if never fully love, the Lord of the Rings DVD box trilogy. In summary, the multi-talented singer, dancer, choreographer, actor and all-round television personality doesn't get it wrong often, but Paula just might have erred here; straight up.

References

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