(Wheaton et al., 2016)

> Reading this paper, I kept thinking of segments from the Frontline documentary from the weekly readings. Dr. Carskadon stands out with her phrase "a sea of sleeping faces," depicting teenagers as they experience that dip in alertness due to the circadian clock features of the adolescent brain, making it look as if they have a significant sleep disorder.

> With less than one percent of adolescents getting adequate sleep, this is a cause for concern, mainly as the tendency is to stay up late into the night for most students at this age.

> Since early class times are artificially set and regulated, and knowing that this disadvantages the adolescent brain, it needs to be re-evaluated.

> Because it has implications in terms of appetite regulation, reduced physical activity and excess weight, poor mental health, there is a health and well-being component related to this timing that demands closer attention by policymakers.

> Coupled with higher risk predisposition, the reduced amount of sleep further decreases a student's ability to exert self-control with aspects of unhealthy behaviours such as substance use or unsafe sexual practices.

> Late bedtimes and early rise times seem to be the combination where the artificially set early morning school class times implicate the policymakers.

> As Dr. Carskadon from Brown University was saying on the Frontline video "Inside the teenage brain", there are biological underpinnings to the exhibited behaviour regarding sleep times in adolescence.

> The policy statement published by the American Academy of Pediatrics makes the case that early school start times directly impact most aspects of the adolescent's life, to the extent that the amount and the quality of sleep affects every facet of our lives.

> It is not surprising that increased absenteeism is related to start times.

> That there appears to be an observed link between school start times and teen crash rates is especially disturbing, affecting not only the teens themselves but everyone else on the road.

(Whitfield-Gabrieli & Ford, 2012)

> This is an interesting aspect of Schizophrenia that also ties nicely to the inner world-outer world explanation of the DMN. Since Schizophrenia is characterized by a blurring of the boundary between what appears externally and what is

> manifested internally, it seems as if at the level of the brain, too, there is an inertia towards an inner reality at the expense of interfacing with the outer reality.

> It is particularly enlightening how personal introspection, autobiographical memory and future thoughts tend to lay dormant while we are focus on a task, but then tend to go online when the external world does not place demands on cognitive resources; a fitting analogy would be the survival vs non-survival mode in evolutionary terms.

> Interestingly, this unconstrained thought during DMN activity shows consistent brain activation patterns across subjects, irrespective of the variation in thinking that one may encounter among individuals, suggesting innateness to brain the function associated with DMN.

> It was interesting to see the dark energy analogy applied to spontaneous brain activation, accounting for up to 80% of the brain metabolism. It is anything but "stand-by-mode," according to what we know.

> Likewise, from the DMN perspective, a "task deactivation" occurs when the brain processes associated with goal-directed is the focus, with the four regions named the task-negative framework.

> This article suggests a total engagement of cognitive resources and a constant negotiation between the DMN

and the task-positive network.

I kept thinking about the ageing brain and the effect of ageing on the DMN; the exhibited mental performance, particularly regarding autobiographical memory and introspection, seems to be affected in older adults. I wonder whether the reminiscing activity that older adults engage in is an attempt at restoring a potential decline in DMN activity by strengthening those pathways.

This article speaks further to a blurring of the line between the external and the internal world for people with Schizophrenia through various contributing underlying brain processes.

When reading about the DMN hyperactivation in people with MDD, I recall Dr. Sapolsky's lecture about how active the brain of a person with depression is. Also, it seems no coincidence that any goal-directed activity that gets a person out of "one's head," such as exercise or socializing, maybe. Getting out, and engaging with the world, are some of the natural recommendations that speak to potentially an effort to draw resources from a hyperactive DMN and redirect them towards a PTN to restore an optimal reciprocal balance between the two.

The polar opposite profiles of DMN activation in schizophrenia and autism respectively seem very interesting and opens up new questions for me. Could it be that DMN inadvertently is hypoactive in autism because of

> a likely impairment ToM, and therefore a diminished amount of time spent in personally relevant activities to do with introspection, autobiographical thinking, and concern with the social reality of oneself as part of the social environment?

> A reduced DMN activity observed in individuals with ADHD seems a bit different in profile to autism but also raises questions for me, mainly around the profile difference between the two. In ADHD, it seems as if the iTPN is too busy with the external world and interacting in a goal-oriented fashion, allowing for adequate introspection or evaluation at an autobiographical level, mainly because the attention is likely hijacked before any meaningful DMN activity can occur.

> The section of the author's perspective helps highlight some of the observed differences that tend to impact attention (problems following conversation), staying present and losing time (mind-wandering perhaps when paying attention is called for), problems with working memory etc.

(Koziol & Budding, 2009)

> Koziol reminds us that basal ganglia and the cerebellum seem implicated in movement through joint processing of such activities.

Koziol et al.'s description of the cognition and motor function as packaging leads me to think that he believes we tend to trivialize an otherwise complex brain behaviour relationship.

The corticocentric view seems to be Koziol's criticism of having created a reductionist view of brain function in which the cortex is mainly responsible for "pulling the levers" whereas the underlying structures perform rudimentary functions in support of the neocortex, which seems to undermine what goes on at the subcortical level, both in terms of relevance and importance

This is where Koziol points out that if we are to assume that there is top-down control, that it is just as likely that our experiences are shaped bottom-up in a meaningful way. Studies implicating the basal ganglia and the cerebellum in emotional functioning are mounting.

Purpose of Koziol's book is to examine the role and the contribution of the underlying brain structures, and it will do this through anatomical and functional evidence.

Koziol and friends warn against "cortical conclusions" that horizontal two-dimensional view of the brain would have, in the case of the patient suspected to have dementia, an issue with a hypothalamic tumour.

> Main argument that Koziol and friends make in this paper is that by neglecting the contributions of the underlying subcortical structures, one risks attributing symptoms presented to presentations that mimic cortical involvement, which distorts the clinical picture.

> that the subcortical regions decide what gets returned to the cerebral cortex implies that the subcortical structures seem to be a lot more involved in the higher-order processes than initially thought
>
> Koziol article sums it up with two key points, discussing the role of associative paralimbic regions extending beyond the motor domain as well as the implication of basal ganglia, which is interconnected to various areas of the neocortex, exerting influence over, and modulating perception, cognition, affect and action.

> The ability to adapt one's behaviour in a sequential manner and with a reasonable force of movement seems to be quite relevant to what a School Psychologist may want to pay attention to regarding what is observed in students.

> The example of throwing a ball seems like an excellent example of the interplay between the cerebellum and the cognitive processes involved in spotting an object, in this case, a target, aiming to shoot the ball at it, regulating the force and intensity of the throw such that one does not overshoot or undershoot.

> The example of cognitive dysmetria as a thought disorder related to cerebellar circuitry seems particularly interesting as it resembles the overshooting or undershooting with the basketball example discussed earlier.

> Inability to regulate affect also seems to implicate the cerebellum.
>
> This sounds like a cerebellar - cognitive modulation discrepancy as well.
>
> Linking it to a student's behaviour regarding pragmatics seems interesting, and it may indeed point to a cerebellar - cortical deficit. I might want to look at deficit programs as they relate to my topic of research.

> The examples are given by Koziol and friends in the presenting profiles of cerebellar-cortical control seem fascinating.

> It also sparks some curiosity for me, regarding what is considered abnormal, or when it is neurodiversity dialled in just right, such that you have a variation in inhibitory control that will make for a healthier human population precisely because of the variation in inhibitory/excitatory control that individuals present as they dynamically interact withone another.

> Stimulus-based control sounds like procedural memory, and the advantages and disadvantages of each are exciting

> and applicable to the job of an SP, particularly as they relate to habits or conditioning that is maladaptive. The argument for lack of creativity in a strictly stimulus-based control even gives clues to how a certain student profile can be explained in terms of personality but from a neuroscience perspective.

> The higher-order control depicted here shows an advantage to the adaptation to the environment, but with the drawback of slower processing as a result. In other words, automatic = fast, spontaneous, creative, higher-order = slow, and slow can be detrimental for adapting purposes. Wisconsin card sorting test would evaluate for this task switching. The test taker would incur a cost for inability to shift strategy or inability to recognize one and automate to perform faster.
> The evolutionary necessity of these two systems is explained by Koziol in this paragraph, in that both are needed. Still, the interaction between the two needs to remain fluid and reciprocal.

According to Koziol and friends, an efficient switching and change between these two systems appear to be the optimal balancing point, yielding the best adaptation for the individual. When this balance is disrupted, we are likely to see presentations such as an overactivation or underactivation of certain networks, thus affecting the individual's ability to adapt.

> The ability of the frontostriatal loop to effectively alternate between these two systems seems fascinating, especially

> the phrase describing how it conserves adaptive resources, which allows the system to benefit from the experience.

> Koziol reminds us that the procedural memory system is routinely overlooked in a cortico-centric model of neuropsychology.

> Critical point to remember why and how excitatory and inhibitory mechanisms are necessary for one another.

> It is interesting that the posterior, more recent expansion of the cerebellum phylogenetically is related to cognitive functioning, whereas the vermal region would be closer to affective functioning.

> The summarizing of the cerebellar function depicts it as a real-time, online mediator of the selected behaviours closely related to timing performance of the excitatory and inhibitory processes, almost like fine-tuning apparatus that executes to a much higher resolution what the higher-order processes intended to execute.

> There are important statements throughout the assigned reading that help me in my understanding of the role of the cerebellum, the basal ganglia and the cerebral cortex, working in tandem, but also attributing equal representation to cognitive and affective processes alongside movement when it comes to the cerebellum.

(Koziol & Budding, 2013)

> The distributed network perspective, while replacing the localizationist perspective, still remained cortico-centric.
>
> Large scale brain networks, encompassing neocortex, basal ganglia and cerebellar interactions are the more recent interpretations of the brain function.

> This is very interesting to realize that the DSM does not have adequate interrater reliability. It makes me wonder how people are supposed to diagnose or demonstrate competency adequately, in the case of the up-and-coming professionals, when the DSM itself lacks the interrater reliability required.

> We discussed this in class as well, but it is important to recognize the circular reasoning between ADHD on one end and inattention, impulsivity and hyperactivity on the other.
>
> It is striking to realize that in 80% of the cases, ADHD co-occurs with something else, not including learning disabilities and developmental coordination disorder.

> The aim of including multiple etiologies seems to be to draw attention to the heterogeneity of ADHD that provides for perspectives other than behavioural to distinguish further presentations that make ADHD comorbid with other conditions.

> It appears that, at least when it comes to ADHD, the neuropsychological tests that help identify its symptoms make neuropsychology relevant in the quest to understand the disorder.

(Riedl & Léger, 2016)

> I just started this, but won't be able to finish it before the lecture, and will continue reading it throughout the course

> NeuroIS sounds fascinating, in that most of the analogy I connect the learning about neurobiology is through similar interconnectivity that I am familiar with from computer programming, which I do a little bit on the side. This is especially the case with the modular nature of object-oriented programming where functions take in arguments and output a result, serve as good conceptualizations of interconnectivity brain circuitry for me.

> Figure 1.3 showing Reference disciplines of NeuroIS helped understand the relationship of the various disciplines and how they place in the theory to design continuum.

> This book /journal issue gave me an idea of a side project I may complete as an appendix to one of my course projects, either for EDPS 654 or for EDPS 867

(Dennis, 2010)

> What a disservice to the life work of Margaret Kennard to mischaracterize her work into something that is perpetuated like a meme, undermining Kennard's contributions as a founder in neuropsychology, with landmark contributions to what we know about recovery of function after brain lesions.

> *"The human brain retains a baseline level of plasticity throughout life - this is known as experience-dependent plasticity and underlies all learning [7]. Plasticity during sensitive periods, by contrast, is experience-expectant - an organism ' expects ' to be exposed to a particular stimulus during this time"*
>
> This was an enlightening paragraph, outlining the experience of expectant plasticity relative to experience-dependent plasticity.

(Fuhrmann et al., 2015)

> *"The human brain retains a baseline level of plasticity throughout life - this is known as experience-dependent plasticity and underlies all learning [7]. Plasticity during sensitive periods, by contrast, is experience-expectant - an organism ' expects ' to be exposed to a particular stimulus during this time"*
>
> This was an enlightening paragraph, outlining the experience of expectant plasticity relative to experience-dependent plasticity_

> *"White and grey matter show complex patterns of change over the lifespan . White matter volume and integrity increase throughout childhood and adolescence into adulthood in many cortical regions. Grey matter volume, in contrast, increases from infancy through childhood, then declines throughout adolescence and into the twenties. These changes are particularly pronounced in the frontal, parietal, and temporal regions during adolescence. The ongoing development in the white and grey matter during adolescence is accompanied by changes in cognitive function, including improvements in intelligence quotient (IQ) , working memory (WM), and problem-solving. Social cognition also undergoes pronounced changes during this period of life, including signi fi cant improvements in perspective-taking and face processing [85]. Risk-taking and sensation-seeking behaviours decrease from adolescence to adulthood ."*
>
> Reading the argument above, regarding adolescence as a sensitive period, it would be important to consider how any time significant changes are occurring in the brain, such as the improvement in working memory, problem-solving social cognition and perspective-taking, that the adage that "we adapt for better or worse" highlights the need to take the period of adolescence particularly seriously. At the very least, our aim as professionals and society should be to avoid the impact of maladaptive behaviours, such as marijuana use being used as an example, the missed educational opportunities and stress, which can adversely impact this experience expectant plasticity._

(Giedd, 2012)

> The Gied article spoke to me personally, as I have been on a personal quest to minimize the effects of the attention economy in my life. I try to fend off this bombardment of social media algorithms by reducing their impact through limited access or blocking features such as Newsfeed Esaser plugins and timers that turn off distractions for a set amount of time, so deep work without distraction is possible.

> This is a challenge that today's adolescents face; the inverted U shape developmental trajectory of gray matter, and particularly the delay in prefrontal cortex development, make the adolescents particularly vulnerable to neuromarketers, who in turn are hard at work in fine-tuning their intermittent reward algorithms to match the vulnerability of the reward circuitry teen brain.

Hubbel Weisel Experiment

> Interesting discovery, how the impact on vision occurred precisely during the presumably sensitive period of the visual development in a cat, where a use-it-or-lose-it principle ended up affecting the deprived eye.

> Also interesting how the critical period in primates is 6 months instead of 3 months observed in cats

> the realization that there is a competitive exchange of resources going in the brain further supports the "use it or lose it" principle

> this emphasizes the importance of addressing issues in the critical period since missing links at this time can have lifelong effects on the animal's vision in this case_

(Koziol & Budding, 2013) ← week 3 readings

> The chapter on Functional Specialization starts by acknowledging the advances made by the pioneers such as Broca, Wernicke, Milner, and Penfield and noting that they were corticocentric in their view.

> Koziol article contrasts the work of the pioneers with the current understanding of the brain through neuroscience, demonstrating the involvement of not just the cerebrocortical influence but cortical basal ganglia, cerebro-cerebellar, basal ganglia-cerebellar connections that contribute to what manifests in terms of behaviour.

> Koziol stresses that when it comes to ADHD, advances are made in understanding the underlying distributed brain networks that extend beyond the corticocentric model, hence the demand for understanding the brain in ways that encompass subcortical functionality at a neuropsychological level by practicing professionals such as SP.

The resting-state MRI studies mentioned in the Koziol article appear to discuss the default mode network.

Koziol goes beyond the default mode and task-positive modes to a total of seven types of connectional profiles, as identified by Ye and colleagues.
The nteworks are:

- frontoparietal
- dorsal
- ventral
- visual
- limbic
- sensorimotor and
- default

_Frontoparietal network - effortful cognitive tasks that require rules to be kept in mind guide behaviour. To do with

- cognitive control
- executive function
- working memory
- Basal Ganglia and cerebellum implicated in working memory tasks.
- Goal-directed behaviour, problem-solving.

Dorsal Parietal attentional network - traditionally referred to as the "where" pathway, or the dorsal stream.

- procedural memory for actions
- premotor regions

- practical representations of opportunities for action
- aka "how to do" network

Dorsal Attentional Network - goal-directed, top-down executive control processes

abnormal patterns here == attentional and working memory tasks in patients with ADHD

The what network, object identification
what the object is used for
behavioural praxis, or potential action implication

Dorsal and ventral pathways complement each other in operation, connected through the corpus callosum to the hippocampus, where memories are formed by associating inputs from the two
believed to be integrated as early as 9 months of age

temporo-parietal regions in the case of ADHD seem to be involved with the performance of tasks that require working memory and inhibitory control

the visual network consisting of the occipital lobe is where the beginnings of the dorsal and the ventral streams are; hence the medial occipital regions are implicated here in sustaining attention and in suppressing attention to irrelevant stimuli

Typically, the default network is less active in goal-directed behaviour; however, for individuals with ADHD, these regions are competing with task-positive networks because the activity in this region is not suppressed.

Sensory motor cortes
-ventral premotor cortex

- primary sensory cortex
- secondary sensory cortex
- putamen,
- thalamus,
- cerebellum

An important section on the paper that points out how most studies cited refer to adult participants, so the developmental processes are not well understood

Interesting that children had stronger connections between subcortical and primary sensory association and paralimbic areas, whereas young adults had stronger cortico-cortical connectivity between limbic, paralimbic and sensory association areas

And children grow up, sometimes they outgrow certain frontostriatal deficits, and this seems to correlate with a weakening of the more short-range functional connectivity and strengthening of the long-range cortico-cortical functional connectivity.

> That hyperactivity can decrease with age, in support of the maturational hypothesis of ADHD seems to decrease with age, coinciding with a gradual decrease in sensorimotor activity as a child grows up, and the ventral and dorsal attentional systems gain more control with age

(Stiles et al., 2012)

> The stiles article was a wonderful review of my earlier Neuropsychology lectures, and I have always been fascinated, particularly with neuronal migration and how neurons "know" where to go. It seems very mysterious to me. On the other hand, practically speaking, genetic signalling emphasizes its response to the environment. The epigenetic shaping that takes place throughout development and particularly during earlier years, critical stage, sensitive stage and beyond into the earlier years, can not be emphasized further when looking at the impact that the child's environment can have on their development. Our role as SP has to be that insistence on positively affecting the child's environment at all tiers of interventions.

(Zelazo, 2020)

> Performance on a battery of EF measures seems to suggest latent psychopathology.
>
> That EF impairment predicts latent psychopathology seems like a dull hypothesis initially, circular in that ACEs and other

sources of stress are bound to contribute to impaired EF. Both ACE and stress factors present in a child's life are likely mediating variables. Also, there is a great likelihood that a child in such an environment inherits some of the parental traits that may contribute to a disadvantaged environment that the child at risk finds themselves in. This would be especially the case with ACEs involving domestic abuse, for example, or similar setbacks due to inadequate family dynamics. This would predict EF impairment in a school setting, which would predict latent psychopathology.

The "Hot EF" and "Cool EF" in the Zelazo and Muller work almost parallels the Default mode Network and Task Positive network, the difference being that Cool EF seems to involve emotionally neutral contexts and lateral PFC. In contrast, hot EF skills seem to be motivationally significant and relying more on VMPFC.

Also noting that "Hot EF" and "Cool EF" appear to exist in a continuum, apparently through a give-and-take between these two networks from Cool EF to hot EF and visa versa.

Lesion studies and TDS along with imaging were used to observe this Hot EF Cool EF exchange.

The dissociation between knowing and doing appears in the Zelazo article as well, for children at age 3. In contrast, differences are observed two years later, at 5, when they perform better on the Dimensional Change Card Sort,

which seems to be a card sorting game looking at task switching, similar to the Wisconsin Card Sorting task.

The earlier article that discussed the loosening of the proximal connections and the strengthening of the distal cerebellar connections as a child gets older also seems to explain why this improvement in inhibition and cognitive flexibility takes place as certain aspects of the

Iowa Gambling Task seems to require both Hot EF and Cold EF since the reward gradually diminishes over time. It seems as if the hot EF is also guiding the decision in the case of IGT before cool EF picks up on the strategy.

This way, as the IGT strategy changes, different skills of EF become more relevant, so cognitive flexibility is helpful in this case.

The IGT scenario really stresses out how EF is important in regulating emotions, modulating approach-avoidance reactions the ability to step back and look at the larger picture from a cooler metacognitive and rational state of mind or go with the hunch that theHot EF picks up before Cool EF can figure it out.

That cool and hot EF skills predict ToM in children seems intriguing.

It appears that reflection training has a meaningful effect on EF skills, according to a study by Espinet et al. (2013)

> The utility of Cold EF Hot EF continuum in teasing out typically comorbid conditions of ADHD/ ASD/ CD/ APD FAS gives the Cold EF/Hot EF credibility as a significant consideration when looking for interventions that would tackle the individual profile of a condition.
>
> Authors conclude that the role of EF difficulties can be understood in relation to the proposed Hot EF / Cold EF continuum. Recognizing the adaptive role of EF skills, the hierarchical nature of the neural systems underpinning EF skills and the malleability or plasticity of the EF skills over time, there is a promise that by targeting EF skills through scaffolded training, positive change will occur over time. Suppose the model is correct and the interventions bear results. In that case, it may be possible to strengthen the top-down EF skills enough to push back on the bottom up negative influences and exert control over impulses so that a restorative balance is achieved over time.

(Koziol, 2014)

> I have to admit that reading the Zelazo article, I was conflicted about the nature of the argument, as it was a few layers too abstract, and it sounded a bit too theoretical, much like an abstract problem where the assumptions we cake are considered true just for the exercise.
>
> Here, Koziol and friends bring us to the ground by reminding us that "working memory,"inhibition," "planning," and "shifting cognitive set" are terms with no universally agreed-upon definitions of these subcomponents."

> To the credit of the Zelazo article on the Cold EF ↔ Hot EF dimension, there were some strong claims backed up by supposed evidence,m so unless I can evaluate these interventions that Zelazo speaks of, I am in no place to make a judgment.

(Dehn, 2010) (ch 1)

> Despite having access to tools, seldom do comprehensive assessments of memory even though memory is crucial to all aspects of learning and therefore should be more of a focus to understand the challenges that children face

> Interesting that there are many children with memory impairments that are never tested and go undiagnosed.

> Many districts subscribe to the RTI model and use it extensively to address children's many learning challenges. The question is, how many children are denied effective strategies to address specific issues because adults are not looking at the root cause of their learning challenges?

> Learning and memory are tied together but not the same thing; memories are stored over time and can be retrieved in different ways depending on how they are linked to other memories. Learning is the encoding and the transition of new information into longer-term storage.

> With each practice session, memories increase in strength and even when you have 100% recall, the more one practices, it can still improve the speed at which memories are retrieved. In the classroom, this is very useful as it promotes mastery learning of concepts; it is vital for students to continually practice skills they are competent in as it will improve their speed of recall, thus using less time and effort to make connections with the material that is so well-practiced

> Because children are not able to indicate issues with memory or don't know they have challenges, it makes sense that they are often misdiagnosed

> A practical takeaway: "Teachers who address memory challenges, teach memory strategies and mnemonics, and adopt more instructional practices that specifically support memory, may ultimately reduce their burdens rather than adding to them."

(Dehn, 2010) (ch 2)

> so many parts of the brain play key roles in memories but have no part in where they are stored
>
> forming a memory takes so many parts within our brains working precisely to encode various bits of information to flesh out a full memory. Then, the brain can also connect to other memories, pull it all together, and have it work so well!!

> the information of a memory traverses both hemispheres of our brain and can run into an issue at any time, but our brains can find many different ways of assembling memories so that one part of the brain can compensate for another,
>
> good takeaway and in a way fascinating: Although children may process information in a different way qualitatively relative to how adults process it, their memory structures and functions appear to be equivalent to those of adults by six years of age