STUDY SPACES: DESIGNING FOR WELLBEING IN AN 'ECHO' PANDEMIC SUMMARY OF SPECIAL LEAVE RESEARCH

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INTRODUCTION – PANDEMIC CONSIDERATIONS FOR STUDY SPACE DESIGN

Not long after the Covid-19 global pandemic was declared and businesses, offices, and educational institutions were shut down, university students made it clear that they still needed access to library study spaces. While many workarounds were devised for teaching and learning (i.e., a broad shift to online learning), for some there simply was no replacement for a quiet, well-equipped study environment (desk, computer, wifi). Written feedback from students stated that their cramped personal quarters were woefully insufficient. Library study spaces were more important than ever and needed to be managed not just as physical spaces but as a service (Connaway et al., 2021) and were therefore made available and booked through online booking systems. This was the general experience for post-secondary institutions (Bork-Hüffer et al., 2021), including Dalhousie, and the demand continued into the third year of the pandemic, despite multiple shutdowns and various waves of virus activity.

At the beginning of the pandemic, I wondered if we would see changes to this space demand as students eventually adjusted to the "new normal". The concept of a "new normal" has since morphed into the "next normal" and although the future continues to remain uncertain, the consistent use of study spaces throughout the pandemic appears to indicate an ongoing demand.

Within the academic library and post-secondary education literature, there are various predictions of future campus design and space allocation. There is a call for libraries to manage all their institution's study spaces in order to manage the high demand due to limited seating and social distancing (Cox & Felix, 2020). Architects are designing for future pandemics with things such as barriers and socially distanced seating (Shumaker, 2021). According to some, large lecture halls may be repurposed (Lynch & Goldenberg-Hart, 2021), and only individual seating should be provided (Cox, 2020). To me, these suggestions seem reactive and off the mark when the full picture is considered and could potentially do

more harm to stressed and anxious students. Afterall, space has an impact on student mindset (Carlson, 2021).

Since we are talking about mindset, we should consider how the pandemic has already impacted student mental health. In the U.S., the Healthy Minds Study (a survey which has been collecting mental health data from post-secondary students since 2007) has been tracking an ongoing upward trend in student anxiety and depression which has continued into the pandemic. According to the data gathered by the U.S. Center for Collegiate Mental Health, specifics such as "trouble sleeping" and "academic distress" increased in the fall of 2020. Data gathered by Ohio State University indicated that 71% of their students were experiencing burnout by spring 2021. Student counselors are observing an increase in anxiety related to the current situation (rather than the past or future) and there is evidence of Post-Traumatic Stress Disorder (PTSD) from the constant stress (Brown, 2021).

Several authors are calling for universities to accept their responsibility for student mental health and whole-heartedly support student needs (Connaway et al., 2022). We must ensure students feel comfortable in our spaces (Whitmer, 2021). There is even a prediction that students will be more inclined toward empathic contacts and relationships with their university (Sens & Moll, 2021). Are universities ready, culturally, and in terms of space design, to do this? As already shown, anxiety and depression have been on a continual increase among post-secondary students, long before the pandemic. As many issues have been brought to light in the dark of the pandemic, this is just another. Universities may have noted the rise in mental disease but perhaps not their impact on it. In terms of student study spaces, I have sometimes witnessed an institutional cultural attitude of: 'this is the best we can do; they will have to deal with it'. There has been insufficient concern for whether or not students feel comfortable, let alone safe, in our study spaces, but in order to succeed in their academic work, students must first feel physically and psychologically safe. We've known this from Maslow's Hierarchy of Needs for 80 years now (Maslow, 1943).

Basically, it's the ethos of the university that will dictate how libraries will provide study space (Baker & Ellis, 2021). It is my hope that the results of my sabbatical research will provide considerations for future study space design at Dal Libraries.

Author's Note: For this special leave, I conducted exploratory research: I read wide and far, explored many concepts, and often followed a trail of tips in the literature, in the news, in conversations, and in personal experience both past and present. I wish to note here that this research was conducted during the Omicron wave, the resulting personal isolation, the Freedom Convoy protest, Russia's invasion of Ukraine and war crimes, the Mass Casualty Commission inquiry into the April 2020 mass murders in my province, a family illness, and a reflection on my own childhood traumas. Some of this research – particularly the increases in domestic violence during the pandemic – was difficult to process during these dark days. This was a mentally heavy sabbatical, but my hope is that this paper offers a focused and optimistic way forward when it comes to study space design.

THE COVID GENERATION

Early in the pandemic, many weighed in on how it could define Gen Z. Jason Dorsey, president of the Center for Generational Kinetics, opined that the pandemic would be the "9/11 of the Gen Z generation" and Cyrus Beschloss of College Reaction Polling suggested this generation would process "profound trauma shared by the community" (Kight, 2020). Axios journalist, Stef W. Kight, reported that the pandemic would affect Gen Z's physical social interactions, their economic and employment prospects, their view of government protection of the economy and public health, and their attitudes toward secondary and post-secondary education (2020). Robert Glazer questioned if Gen Z will even want to go to university (Glazer, 2020). And even before the pandemic, in 2018, The Chronicle of Higher Education predicted the next generation of students would be more economically conscious, concerned for their finances, and "more practical and more focused on relevant academic programs and support services than on bells and whistles" (The New Generation of Students, 2018). We should, however, be cautious in describing a Covid Generation as this could lead to a pygmalion effect (Rudolph & Zacher, 2020b).

Rather than attempt to define a Covid Generation, some sources looked at generational differences in responses to, and perceptions of, the pandemic. In survey results from across 50+ countries, age positively correlated with perceived costs of getting Covid, and negatively correlated with perceived costs of restrictions, and younger people reported being more lonely than older people. (Age, however, was no indicator of adherence to rules.) (Jin et al., 2021) According to Statistics Canada's Canadian Perspectives Survey Series, youth's biggest concern in the early part of the pandemic was not for themselves but for

the health of vulnerable people (*Activities and concerns of Canadian youth during the COVID-19 pandemic,* 2020; Arim et al., 2020).

Rudolph and Zacher tell us that we need to be careful with generationalisms and instead look at socio-economic factors (2020b) or a lifespan development framework (2020a) to determine how the lives of younger people may be impacted by this pandemic. Perhaps we can see if we can learn anything from other cohorts of adolescents who lived through other major events. One article looked at 18-25 yr olds during the Great Recession (Dec 2007-Jun 2009). Although dissimilar to a global pandemic, some findings may resonate: 1) In times of hardship, social relationships and collective agency become the focus (i.e., assisting each other). 2) Ages 18-25 are the "impressionable years" - a critical, "make or break" time when significant external events can have lifelong impacts on lifelong beliefs and values and end up shaping societal values and economics. 3) The economic impact on 18–25-year-olds from the recession took the form of large student loans and earnings barely above minimum wage, yet this group didn't expect help from governments or societal institutions (or were independently ameliorating the inadequacy of those). 4) The recession slowed the "development of positive self-views" and was linked to increases in depression and "lowered levels of subjective health". 5) Levels of self-esteem among adolescents continued to drop after the recession (Schoon & Mortimer, 2017).

From this point on, the focus of this report will be specifically on adolescents (ages 10 to 19, according to the World Health Organization [n.d.]), as these are the students of our near future.

PANDEMIC IMPACTS ON ADOLESCENTS

Please note: The reader is encouraged to practice self-awareness and self-care as some of this section's content may be triggering.

As we attempt to recover from the pandemic even as it continues, the best first step is to acknowledge that the pre-pandemic versions of ourselves are gone. We are all now different. We are in a "third state". Nalini Nadkarni, an ecologist who had been studying ecosystem disturbance and recovery when she fell 50ft from a tree canopy, wrote a reflection piece on her recovery against the backdrop of her research. In it, she provides a beautiful first-hand story of recovery from a "disturbance" and acknowledges a personal "third state" as a result. Using her own experience of her life-changing accident as an overall example, she shares findings from her transdisciplinary colloquium on disturbance and recovery theory - i.e., her work before her own disturbance. Pulling solutions from other systems disturbances (traffic disruptions, forest fires, "retirement" of dancers, war refugees), she suggests the following for adjusting to our new lives: find information for personal understanding, look for examples of positive outcomes, include nature or images of nature in surroundings for healing, establish means for connecting with others, allow a slow process, and accept the "third state" - "not better, not worse, but different" (Nadkarni, 2017).

While psychologists have put forth some fascinating theories as to how the pandemic has psychologically affected us as a whole (see Jin et al., 2021, and Leuzinger-Bohleber & Montigny, 2021 for explanations for Covid denial and conspiracy theories), the more crucial thing to consider is the impact the pandemic is having on children's psychological development. In particular, the pandemic has caused significant risk to adolescent development in a myriad of ways. Leuzinger-Bohleber & Montigny explain that adolescence is a "second chance" within our lives to process early childhood trauma, for identity creation, and for brain changes – all of which require socializing with others. The pandemic, with masking, social distancing and shutdowns, has limited these crucial interactions, making this "second chance" a "second hazard", particularly for traumatized, poor, immigrant, and/or racialized adolescents (Leuzinger-Bohleber & Montigny, 2021).

The Society for Research on Adolescents' (SRA) Covid Response Team (an international, interdisciplinary research initiative to investigate the pandemic effects on adolescent development) released a commentary stating that for all the ways the pandemic has impacted adolescents, it's been especially harsh for the marginalized and less fortunate, including immigrants, and it is unknown what the lifelong impacts will be. In terms of the educational and vocational

futures of adolescents, their research has mirrored the impacts of wars and the Great Depression and Great Recession, including disruptions in emotional regulation and development and academic aspirations (*COVID-19 Response Team*, n.d.). Reflecting back to the Great Recession, researchers noted an increase in abuse related internet searches such as "my mom beat me" or "my dad hit me" (Bryant et al., 2020). Looking back to SARS, a study conducted on children during that outbreak found that children who experienced quarantine were four times as likely to experience post-traumatic stress than those who did not (Sprang & Silman, 2013).

The Covid Response Team argues that institutions and communities must step up to help youth recover from pandemic disruptors such as quarantine and restrictions, social isolation, increases in domestic abuse, household financial impacts, housing insecurity, prolonged family illnesses and deaths in the family (Hussong et al., 2021) while other researchers have called for a universal public health approach to combat the trauma experienced (Perks et al., 2020). In addition to the detrimental effects the pandemic is having on youth, the Response Team acknowledges what they refer to as a duo pandemic: Covid-19 and the social unrest/justice movement (*COVID-19 Response Team*, n.d.). The pandemic has been damaging to youth who "already carried the anxiety and trauma of surging racial tensions, political uncertainties, and climate crises delivered without interruption to their pockets via cell phones" (Hussong et al., 2021).

Also affected by the pandemic, caregivers can be absorbed in their own trauma and may not be bridging the communication gap to help adolescents (Leuzinger-Bohleber & Montigny, 2021). Parenting has been challenged during the pandemic, leading to "harsh parenting" and fragile families (abuse, worsened neglect), and the economic fallout has added even more pressure to families, all causing "lifetime and intergenerational consequences" (Perks et al., 2020). According to the Canadian Perspective Survey Series, remote work does not appear to affect family stress but financial losses do (Béland et al., 2021).

Regarding child abuse and neglect, one study looked at numbers of child abuse and neglect investigations in four U.S. jurisdictions before and during the pandemic and estimated that 200,000 cases went unreported (Nguyen, 2021). A survey of child helplines in 139 countries between April and June 2020 by Child Helpline International, combined with related media searches, could not draw

definitive conclusions but maintained concern that violence would increase in already violent families (Petrowski et al., 2021).

In Germany, the Child Public Health unit at the University Medical Center Hamburg-Eppendorf is conducting a longitudinal study of the pandemic's mental health effects on children and adolescents, called COPSY, which they can compare to the pre-pandemic data from their similar BELLA study. As of writing this document, two phases of the COPSY have been completed and published with a statement that their findings are similar to that of other countries. Some of the summarized findings: four out of five children have experienced negative effects from the pandemic; 39% of children said their friendships dwindled due to lack of personal contact; and anxiety and risk for other mental health problems (aside from depression) rose. There is more family discord, more school-related problems, diets have worsened, and children are spending less time on sports and more time online. Those who fared worse: "families with poor atmosphere … with parents who had a low level of education, or migration background, or if they were living in close quarters (<20 sq m living space/person)". Those who fared better: "children and adolescents who looked into the future optimistically and confidently (personal resource), had a higher health-related quality of life, as did those who spent a lot of time together with their parents" (Ravens-Sieberer, 2020).

The COPSY Hamburg study was conducted early in the pandemic (June-July 2020). Two-thirds of children and adults felt negatively impacted by the pandemic. "The children and adolescents reported more frequent psychosomatic complaints such as irritability, problems falling asleep and headaches. Socially disadvantaged children were particularly burdened. Good family cohesion had a protective effect and was able to mitigate the burden caused by the pandemic" (Kaman et al., 2021).

An Italian survey showed that parents who experience Socio-economic Stress (SES) and those who don't, both reported high stress which they said had impacts on their children's emotional regulation and negativity (which the authors say could have longitudinal impacts). Non-SES parents struggled more with lockdown. Even though their finances were not impacted, the consistency of their work amidst the pandemic backdrop took its toll. While lockdown on its own didn't stress SES parents, finances and household chaos had damaging effects. In both cases, this stress basically resulted in child emotional neglect and SES children arguably need their parents more. On the flipside, these

children have the potential to respond even better to parental attention (Spinelli et al., 2021). (This last finding prompts me to wonder about the potential positive effects of "parenting" behaviours toward students by university faculty and staff.)

Just as the pandemic has exposed vulnerabilities within socio-economic layers so it has within children's mental health. Some children are more vulnerable to trauma and toxic stress. As we have seen so far, and repeated by Jack P. Shonkoff, Director of Harvard's Centre on the Developing Child, social interactions are tremendously important (*PBS NewsHour Q&A*, n.d.). No doubt, it is equally important that post-secondary institutions also remain a place for adolescents and young adults to maintain social activities.

It is important to look at the pandemic effects on adolescents with a trauma lens. Understanding that "traumatizing events usually have three elements: 1) it was unexpected, 2) the person was unprepared, 3) there was nothing the person could do to prevent it from happening" (Substance Abuse and Mental Health Services Administration, 2014), we can generally agree that the pandemic has been a traumatizing event. Among the common types of trauma, we also find matches to the Covid-19 pandemic: repetitive (e.g., shutdowns, school closures, news), complex (e.g., various effects including isolation, domestic disturbances), complex development trauma (occurring during childhood and adolescence), vicarious (e.g., reports of the sick and dying), and collective (community and global impacts).

Some researchers are looking directly at the instances of ACEs - Adverse Childhood Events - such as family violence, physical and emotional abuse, among others, that have lifelong impacts on physical and mental health (*What Are ACEs?*, n.d.). A major study on ACEs conducted in the late 90's examined the life experiences of over 17,000 people, drawing connections between ACEs and adult health. Not only did the study reveal that ACEs were more common than previously realized, these experiences were also linked to various addictions, chronic diseases and mental illnesses later in life (Centers for Disease Control and Prevention, 2022; *Recognizing and responding to the effects of trauma*, 2015). In Canada, various studies have been conducted to determine the prevalence of ACEs with various results ranging from 56% to 76% of participants reporting at least one ACE (Grant, 2021).

Online & phone surveys of parents in Germany in August 2020 revealed an increase in ACEs related to the stress of job loss and finances (particularly

psychological abuse and domestic violence). Families with younger children were especially at risk as were families led by parents who have their own ACEs or who experienced physical/emotional abuse in adulthood. Several studies have shown that this parental stress and anxiety has been linked to increases in childhood depression and ACEs, particularly child abuse. According to the same study, overall rates of child abuse and neglect increased by one-third in the early part of the pandemic (Calvano et al., 2021). This study used parent-reported data so under-reporting is highly possible.

In the U.S., researchers at the Weitzman Institute at Community Health Center are calling for increased supports "within and beyond health care" to avoid lifetime consequences of what they predict as a rise in ACEs from the pandemic (Bryant et al., 2020). Prior to the pandemic, 45% of U.S. children had at least one ACE, with these rates increasing to 61% for Black non-Hispanic children and 51% for Hispanic children (Sacks & Murphey, 2018). In addition, "low socio-economic status as well as social isolation, both of which are on the rise in the current pandemic, are major risk factors for ACEs" (Bryant et al., 2020). I think it is easy to extrapolate that, with the pandemic continuing and as the Dal student population becomes more diverse, ACEs will be more common.

Even prior to the pandemic, childhood trauma was more prevalent than most realize. According to data gathered by the 2019 General Social Survey (Statistics Canada), 62% of Canadians experienced "harsh parenting" (this comprises neglect and emotional abuse), 22% experienced physical abuse, 21% witnessed violence in the home, and 6% were sexually abused. Ninety-three percent who experienced childhood physical or sexual abuse said it went unreported (*Childhood maltreatment and the link with victimization in adulthood*, 2021).

Repetitive exposure to childhood trauma, whether it be the examples of abuse above or accidents, disasters (such as a global pandemic), etc., cause complex developmental trauma, results of which are: "(1) a lack of a continuous sense of self; (2) poor emotion regulation and impulse control, including aggression against self and others; and (3) uncertainty about the reliability and predictability of others, which is expressed as distrust, suspiciousness, and problems with intimacy" (*Recognizing and responding to the effects of trauma*, 2015).

By acknowledging and accepting the difference in ourselves and in our present and future students, particularly the mental and emotional impacts of the

pandemic on adolescents, we ought to re-design our study space experiences with well-being in mind.

SPACE DESIGN - DISEASE PREVENTION, ANTI-ANXIETY, WELLNESS, AND TRAUMA-INFORMED

> *"We shape our buildings and afterwards, our buildings shape us."*
>
> *– Winston Churchill*

The acknowledgement that our built environments significantly affect our health is increasing and needs further attention. Latané, in their article, "What If the Elephant IS the Room?", highlights the mental health crisis among younger people:

> This generation of students faces the fear of school or neighborhood shootings, concern over police brutality and systemic racism, and eco-anxiety. More than any generation before them, they see, hear, and feel local and global injustices in real time through social media. They are burdened by both an expectation that they need college degrees to succeed and the soaring costs of higher education (Latané, 2021).

Applauding the increase in mental health supports, Latané believes more attention should be placed on the built school environment. She encourages three strategies: provide nature-filled environments; design for wonder, beauty, and awe (e.g., highlighting the human and natural history of the building's location); and nurture a sense of belonging (of particular importance at Dalhousie). These strategies can be incorporated in newly designed spaces by ensuring users have a choice of seating, lighting, etc., giving students a voice in the design, and reflecting diversity in artwork and the space design (Latané, 2021).

Corgan, a design firm, posted a three-part blog entry, "Designing Educational Spaces for Mental & Emotional Health" (n.d.), that echoes Latané's sentiments, calling for more empathy within the design of school spaces to mitigate the

sources of stress currently in place such as lack of privacy to emotionally collect one's self, cleanliness and security concerns, sensory overload, air quality concerns, and lack of natural light, all of which are exacerbated by the mental health fallout of the pandemic. A Global News piece about an educational furniture design firm highlighted some post-pandemic space needs: natural light, connections to the outdoors, flexible design/furniture for individuals to customize, spaces that provide choice and autonomy, the means for users to personalize their individual space, and supports for collaborative or solo work (Pod, 2021).

Turning to office space as an example to draw on, MGS Architecture of New Delhi argues that post-pandemic office work requires open, more breathable spaces as well as technology to diminish shared touch points, such as touch-free doors. Distanced workstations, smaller seat clusters, and one directional foot traffic all create protection from infectious disease. "Courtyards, day-lit spill-outs and breakout zones such as terraces" support the general well-being of occupants. The author also suggests that the post-pandemic office must also "bridge the gap between the comfort and ease of working from home and the formalized atmosphere of an office." Perhaps study spaces should be less formal, and more like home as well. "While the future remains undecided, the pandemic has forced us to come out of our comfort zones and question how we live and work. If we are to become resilient to more such disruptions, we'll need to adapt quickly and chart 'a new way' with borrowed wisdom from the past" ("The Office," 2021)

A recently renewed focus within design is how it can minimize the spread of infectious disease. Self-sustaining spaces where all needs are fulfilled - water, food, toilets, etc. - help limit flows of foot traffic. Air cleaning and ventilation are important, but also building materials and surfaces (walls, floors, furniture) that limit growth of pathogens and enable easy cleaning/sanitizing (Pinter-Wollman et al., 2018). Even the placement of hand sanitizers at eye level can increase use (Birnbach et al., 2010).

The built environment also affects chronic disease – including diseases such as depression and anxiety. In short, spaces for social interaction and access to nature are significantly important features. Pinter-Wollman et al. (2018) explain that by acknowledging the role of the built environment in supporting mental health, designers can create opportunities within spaces for people to see, hear and connect with others, and to provide places of refuge, places where we don't

need to be social. Designs that cause "crowding" must be avoided as this increases stress and anxiety. Jenna Scott in Inside Higher Ed suggests that makerspaces can potentially play a huge role in alleviating student stress by providing space for therapeutic exercises, a place to experience a sense of community, and "opportunities to contribute, outlets to heal through making and multiple ways to employ their creativity—and achieve satisfying results for those efforts" (Scott, 2022).

Even before the pandemic, Inside Out, a UK group of learning space designers, called for special design considerations in buildings of high anxiety – particularly university buildings - citing high rates of anxiety well before the pandemic. They suggested that university rankings could someday include "wellbeing metrics" and so campus buildings should be designed with wellness in mind, particularly anti-anxiety design to help students focus and perform well with their academic work. Referencing the International WELL Building Institute's WELL Building Standards (https://v2.wellcertified.com/en/v/community/feature/6), the article suggests natural light, flexible furniture and paneling to give students a sense of control in their spaces; open spaces; spaces that encourage socializing; private spaces; views of nature; and easy navigation (*Anti-Anxiety Architecture*, n.d.). These standards should be consulted when re-designing library spaces.

As discussed earlier, trauma is more abundant than we realize, and we need to apply a trauma-informed lens while providing services and spaces to a student population. We can also support the potential for post traumatic growth – a theory that positive personal growth is possible following the psychological fallout of trauma: "changes in self-perception, changes in interpersonal relationships, and a changed philosophy of life" (Tedeschi & Calhoun, 1996).

A trauma-informed approach is achieved by following the four Rs of Trauma Informed Care (TIC). This approach: "REALIZES the widespread impact of trauma and understands potential paths for recovery; RECOGNIZES the signs and symptoms of trauma in clients, families, staff, and others involved with the system; and RESPONDS by fully integrating knowledge about trauma into policies and procedures, and practices, and seeks to actively RESIST retraumatization" (*Trauma-informed approaches*, 2015).

TIC utilizes six principles:

- Safety – clients feel physically and psychologically safe

- Trustworthiness and Transparency - processes and decisions are transparent in order to develop and maintain a sense of trust with clients and staff
- Peer Support – working with peers for recovery and healing
- Collaboration and Mutuality – facilitating relationships between clients, staff and administration as well as the sharing of power and decision-making
- Empowerment, Voice and Choice – clients are empowered to use their voice, participate in decision-making and given the right of choice
- Cultural, Historical and Gender Issues – responsive to historical and gender-based trauma as well as cultural, racial and ethnic needs (Substance Abuse and Mental Health Services Administration, 2014).

In my opinion, we have the opportunity to provide library study spaces that are trauma-informed. Our spaces can provide for key elements within the above principles. By collaborating with users, we can ensure the spaces are designed so they feel safe and welcome within their surroundings, that there are places for self-care, and that the spaces support peer-collaboration, and reflect openness and transparency.

The Committee on Temporary Shelter (COTS) in Vermont used the TIC principles to develop these Trauma Informed Design (TID) principles for a homeless shelter environment:

- Reduce or remove known adverse stimuli
- Reduce or remove environmental stressors
- Engage the individual actively in a dynamic, multi-sensory environment
- Provide ways for the individual to exhibit their self-reliance (ability to do things for himself or herself)
- Provide and promote connectedness to the natural world
- Separate the individual from others who may be in distress
- Reinforce the individual's sense of personal identity
- Promote the opportunity for choice while balancing program needs and the safety/comfort of the majority (Farrell, 2014)

COTS gives many examples of fulfilling each principle for a homeless shelter environment. These examples can be modified for any built environment.

A research article that gathered data from several permanent supportive housing projects found four approaches of TID: "1) provide multiple common areas to maximize resident choice and safety, 2) separate spaces with walls but connect them with interior windows to provide safety, 3) supply a central third stair to encourage social engagement, and 4) design places for future resident empowerment and voice" (Bollo & Donofrio, 2021). Based on the examples investigated here, I can develop examples that could be applied in study spaces – such as places for making social connections, student input for new space design, a student committee for library buildings, student health and safety teams for each building, student art showcases, a centrally placed map that shows where all the students are from, a choice of spaces if they want to interact, a third stair as another place to socialize, improved visibility in and out of study spaces, and bringing nature into the spaces (i.e., biophilia).

e4h (Environments for Health), an American architecture firm specializing in healthcare and health science environments, has developed some elements for TID, recognizing that "the stress of the current COVID-19 pandemic and pain, grief, and indignation arising from continued political unrest and racial tensions, are increasing the number of people experiencing trauma." The basics of TIC – "empathy and understanding" – are embedded in their approach: "adapting spatial layout, thoughtful furniture choices, visual interest, light and color, art, and biophilic design". Examples for each element include: easy navigation; spaces for therapeutic activities; careful arrangement of seating such as facing out from walls and cornered without barriers in between; soft rather than complex patterns in carpeting, wall coverings, etc.; windows, natural light, independent task lighting and soft hues for light and colour; depictions of nature and avoidance of harsh abstract art; and views of nature and indoor gardens (i.e., biophilic design) (Empathy in Architecture, 2020).

Bassetti Architects developed an open-source TID workbook for learning environments, particularly secondary schools, also stating the prevalence of trauma in school-aged children (affecting two-thirds of children by the age of 16, pre-pandemic, and increasing since). They acknowledge that TID is "emergent" and hope that their workbook inspires further development. (See Trauma Informed Design Workbook). The workbook is extensive and, while only mentioned once, it is clear that Maslow's Hierarchy of Needs forms a good part of the basis. It is highly recommended that this workbook, among other sources, be used for inspiration in redesigning our study spaces to incorporate TID. Some examples include: clear visibility (acknowledging hypervigilance and the need to

feel safe); a variety of 'shelters' (places of refuge, fidget toys); places to nap or prepare food; choice of furniture, lighting, and noise levels; opportunities for interaction with others; and of course, biophilic design elements (McConachie, Bergsagel, & Bharatkumar, 2022).

Health Sciences High & Middle College, a public school in San Diego, redesigned or "hacked" their spaces to be trauma-informed, utilizing the Reggio Emilia approach which acknowledges that the physical environment is a "third teacher" (peers being the second). Among many changes and re-designs, the school ensured sightlines to exits; painted over institutional colours (white, grey, beige) and red, yellow and orange with lighter shades of blue, purple and green; provided den-like spaces to shelter in while having full view of activities; carpeting to absorb loud noises; wheeled furniture to give users choice of arrangement; and plants (biophilic design) (Frey et al., 2020).

Other than the above, TID literature is rather limited, so it is helpful to continue to look within the social work environment where TIC has been in practice for some time, particularly within permanent supportive housing. (People who have experienced homelessness have often experienced trauma.)

BIOPHILIC DESIGN & DESIGNING FOR HEALTH

The concept of biophilia was hypothesized by Wilson in 1984 and rests on the premise that humans evolved on the African savannah. Knowledge of and reactions to elements in that environment led to individual and group survival and therefore to an innate attraction to certain natural features. Many studies have proven the theory of biophilia and the benefits of the natural environment on healing and mental health (see Kahn, 2011 for these studies). "There is substantial evidence to suggest that, as a species, our modern lifestyle may have strayed too far from that to which we have adapted" (Gullone, 2000), which explains why we are so drawn toward nature. Biophilic design is about bringing natural elements into our built spaces or finding ways within the spaces to mimic properties of nature - prospect, refuge, mystery, legibility and fractal patterns (Kahn, 2011).

In post-secondary education, several institutions have placed an emphasis on biophilia. The Canadian Standards Association's "National Standard for Mental Health and Well-Being for Post Secondary Students" (2020) supports nature in spaces for mental wellbeing. Subclause 5.4.2.2 states that learning spaces should

include "providing spaces that highlight connections to the land and incorporating nature into interior spaces to enhance health and well-being". Simon Fraser University developed "Principles for Enhancing Well-being in Physical Spaces at SFU" (n.d.) which include "enhance access and connection to nature" with suggestions including patio gardens and outdoor workspaces. The London School of Economics has a webpage listing all their social and green spaces, such as rooftop and terrace gardens, beehives, etc. (*Social and Green Space*, n.d.).

So why is biophilia (or access to nature) so important? And how does it relate to our modern lifestyle? The obvious answer seems to be stress reduction (and there is a theory to support this) but Kaplan (1995) is more specific: biophilia (or nature) helps us recover from directed attention fatigue. Evolutionally speaking, our directed attention would have been limited or we would not have survived the dangers in our surroundings. "Directed attention plays an important role in human information processing; it's fatigue, in turn, has far-reaching consequences. Attention Restoration Theory provides an analysis of the kinds of experiences that lead to recovery from such fatigue."

In Kaplan's model of the restorative experience there are four components: being away (a new environment, an old environment experienced differently, or even just a redirection of one's gaze), fascination (either an experience or an environment, e.g., seeing a rare animal or being in a cave), extent (the environment is "rich enough and coherent enough so that it constitutes a whole other world"), and compatibility (an environment where one can conduct their actions and behaviours naturally and comfortably). Not surprisingly, "natural environments turn out to be particularly rich in the characteristics necessary for restorative experiences." Again, many studies have proven the relationship between time in nature and attention restoration (Kaplan, 1995). Just as with time in nature, biophilic design can improve attention, reduce stress, improve emotions, lower blood pressure and lower cortisol (stress hormone) levels. (PaRx, n.d.; Vermes, 2021; Ryan et al., 2014)

Biophilic design experiences fall into three categories: 1) nature in the space – which is, as it sounds, bringing natural elements or conditions directly into the built space; 2) natural analogues – objects, artwork, or materials that resemble nature; and 3) nature of the space – designs that provide for our intrinsic human preferences for exploration, mystery and prospect/refuge (Pinter-Wollman et al., 2018). Within these elements, 14 patterns have been identified "from empirical

evidence and interdisciplinary analysis of more than 500 peer-reviewed articles and books" (Ryan et al., 2014). Terrapin Bright Green, a design consultancy firm, published a report on these 14 patterns that would serve well as a resource in any future study space design. The positive mental, emotional, and cognitive effects of each pattern (supported by referenced research) are provided in a table which can be easily consulted to design the required effect. The fourteen patterns, with Terrapin Bright Green's description of each, are:

Nature in the Space

1. Visual Connection with Nature: A view to elements of nature, living systems and natural processes.
2. Non-Visual Connection with Nature: Auditory, haptic, olfactory, or gustatory stimuli that engender a deliberate and positive reference to nature, living systems or natural processes.
3. Non-Rhythmic Sensory Stimuli: Stochastic and ephemeral connections with nature that may be analyzed statistically but may not be predicted precisely.
4. Thermal & Airflow Variability: Subtle changes in air temperature, relative humidity, airflow across the skin, and surface temperatures that mimic natural environments.
5. Presence of Water: A condition that enhances the experience of a place through seeing, hearing or touching water.
6. Dynamic & Diffuse Light: Leverages varying intensities of light and shadow that change over time to create conditions that occur in nature.
7. Connection with Natural Systems: Awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem.

Natural Analogues

8. Biomorphic Forms & Patterns. Symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature.
9. Material Connection with Nature. Materials and elements from nature that, through minimal processing, reflect the local ecology or geology and create a distinct sense of place.
10. Complexity & Order. Rich sensory information that adheres to a spatial hierarchy similar to those encountered in nature.

<u>Nature of the Space</u>

11. Prospect. An unimpeded view over a distance, for surveillance and planning.
12. Refuge. A place for withdrawal from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead.
13. Mystery. The promise of more information, achieved through partially obscured views or other sensory devices that entice the individual to travel deeper into the environment.
14. Risk/Peril. An identifiable threat coupled with a reliable safeguard.

(Terrapin Bright Green, 2014)

Terrapin Bright Green researchers further investigated the effects of 6 of the 14 patterns on attention, stress reduction, and positive and negative emotions. Worth mentioning here:

• Just as there is evidence for stress reduction by being in nature, there is similar evidence for viewing images of nature; however, instances of real nature in the built environment should be prioritized, however small.
• Adding non-visual nature experiences to visual experiences creates an even stronger effect. (e.g., the babbling of water in a fountain installation)
• Providing variability in sensory stimulation, such as through natural ventilation or variation of light, can aid in concentration, while lack of variability can cause boredom.
• The presence of water in green spaces improves mood and self-esteem.
• Fractal designs with a scale of 3 reduce stress (most fractals in modern design are limited to a scale of 2) (Ryan et al., 2014).

Biophilia is not without its criticism, and it would only be appropriate to mention it here. For one, it leaves out the urban poor who don't have much access to green spaces. It could also suggest elimination of the nature we have phobias for, e.g. snakes (Tidball, 2012). For the most part though, the problem is with the term, "biophilia", itself. Kahn suggests an alternate term: "human-nature interaction" and explains the four overarching problems with "biophilia": The "bio" refers to living things; however, much of what we experience as "nature" are not living organisms, e.g., caves, mountains, rocks. The "philia" refers to liking, or being drawn toward, but not all of us enjoy blackflies, mosquitoes or

snakes. Since it is a broad term, biophilia cannot be disproved; only individual hypothesis under the biophilia umbrella can be tested (e.g., gazing at a nature scene improves concentration). And finally, because the biophilia theory is based on evolution, or genetics, then one could assume that all behaviour is pre-determined by genetics (2011). Joye and De Block continue:

> (R)esearch provides compelling evidence that people indeed affectively relate to life-like elements and processes (e.g., animals, landscapes, greenery, and so on) and derive (among others) meaning, enjoyment and health benefits from those relations. Biophilia theory goes awry in placing positive human feelings for life and life-like processes in a narrow evolutionary psychology framework. The theory has overestimated the evolutionary origins of these feelings (2011).

Despite some criticism, supportive literature for biophilia is vast and extensive, and a full review of this literature was beyond the scope of my sabbatical research. Amongst my explorations, however, I found an intriguing principle of biological attraction. This principle is based on evidence that all living organisms have an attractive field that attracts other similar biological systems, and this attraction increases for systems under stress (Agnati et al., 2009). Human society within the Covid-19 pandemic would be one such example.

According to Tidball, large-scale disasters (a flu pandemic was included in the examples) remind humans of their attraction to living things, and of cultivating living things, for their ability to recover and to gather resilience. This is at the individual, community, and larger population levels. In disasters, we are reminded that we are not at the centre of anything and seek out our connections to nature. Tidball provides examples of what they call "green responses" to crises: community gardening by veterans and widows in Bosnia, the caretaking of trees that survived in Hiroshima, the planting of flowers in WWI trenches. Nature is used as therapy, gardening is considered horticultural therapy, and green spaces are used as restorative spaces for those dealing with trauma (Tidball, 2012). Not only does all of the above give support to biophilic design for study spaces, but also to greening activities within study spaces or nearby.

"Green responses" to the pandemic did, indeed, happen. We all witnessed the increase in backyard gardening and in the use of parks. While these behaviours stemmed from mental health reasons, there are issues with equitable access. Some of this is being relieved through the growing PaRx program, where doctors can prescribe free national park passes for the purposes of improving health.

Patients are prescribed 2 hours a week in outdoor settings, 20+ minutes at a time (*The feel good factor*, n.d.; PaRx, n.d.; Vermes, 2021).

Turning to studies of biophilia, the effects of nature on attention restoration have been examined in many experiments. Focusing specifically on university students, Lee et al. suggest that short breaks from studying by looking at a "flowering meadow green roof" would improve directed attention. One hundred and fifty university students were randomly assigned a scene to view during 40-second breaks from their work. One scene was the green roof, the other was a simple concrete roof. The students were given baseline and post-break tasks with which to measure their sustained attention. Their results: "Participants who briefly viewed the green roof made significantly lower omission errors and showed more consistent responding to the task compared to participants who viewed the concrete roof. We argue that this reflects boosts to sub-cortical arousal and cortical attention control … providing direct experimental evidence for the benefits of micro-breaks and for city green roofs" (Lee et al., 2015).

A couple more studies I came across that focused on university students were conducted during the pandemic. One survey study looked at the effects of place attachment and landscape preferences (which can be dependent on cultural background or personal history) on the perceived naturalness of green spaces and how that affects positive emotions. Results: there are different positive effects to emotion; and natural elements like trees, open areas, and bodies of water are essential to emotional recovery during a pandemic (Liu et al., 2022). (This article's literature review provides an abundance of evidence to support green spaces for student mental health.)

In Japan, a case study/experiment was conducted during the Covid State of Emergency that used various tools from other studies to measure the physiological and psychological effects of digital forest bathing and compared these to previous studies of actual forest bathing. The results upheld the restorative effects and showed psychological effects similar to those from real forest bathing. The traits of the digital forest deemed restorative were also similar to the traits of the real forest deemed restorative (Takayama et al., 2022).

Another study provides evidence of the turn toward nature during the pandemic and theories as to why. First, by comparing the impact of the pandemic (both the speed of virus spread and lockdown measures to contain it) on our lives and daily behaviours to the DSM-5 definition of trauma, along with the outcomes of studies on the SARS outbreak, the authors proved the likelihood of Covid-19

pandemic-induced PTSD. Their survey measured and correlated restorative qualities of the home environment and time in nature to post-traumatic growth (PTG). Elements of restorative qualities from both environments predicted spiritual changes, a core outcome within PTG. The authors argue that the psychological effects of Covid and restriction measures may be chronic as the pandemic continues so it is important to know what will buffer the negative effects and bring about growth (Zobel et al., 2022). While the study is limited, it inspires further studies into the potential of PTG from the pandemic, including the effects of natural environments.

> *In my research, I came across a slightly different form of biophilia - cognitive biophilia - how humans anthropomorphize animals in our stories and language (e.g., "sly as a fox", "busy as a beaver"). Nature symbolism is common in all cultures and in design. Nature and animals are important to our development in terms of growth and identity formation, self-realization, sense of reality, managing pain and anxiety, and appreciation of life. We require contact with nature but also nature symbolism for our development in childhood – for speech, thought, communication, identity, and sense of self. This provides further evidence that it is very important that human beings maintain a rich connection to nature (Kahn, 2011).*

Moving to a slightly different model of design, the Salutogenic model is, essentially, designing for health. It is a fairly new concept, and the literature is currently limited. Just as we need healthcare to move from a pathogenic model to a salutogenic one, so too must architecture, for our built environments have an impact on our mental health. Dilani, a leading researcher in salutogenic design, describes it as including "access to symbolic and spiritual elements; access to art; good lighting; attractive space for social interactions; private spaces; and an interior environment that provides positive experiences; … visual and physical access to nature, and personal control over, for example, lighting, daylight, sound, indoor sense of coherence, thereby enhancing … coping strategies and health" (Dilani, 2008).

Golembiewski continues the exploration of salutogenic design by referencing attention restoration theory, stress reduction theory (both discussed earlier), and the biophilia hypothesis but feels they don't go as far as the salutogenic model, which considers the balance of general (or specific) resistance deficits (e.g.

psychological stress) and resistance resources (e.g., sunlight pouring in through windows) within one's experience in the built environment. Where resources outweigh the effects of deficits one would be said to have a healthy sense of coherence. In essence, "good social/emotional, psychological, and physical/somatic health is maintained through a dynamic ability to adapt to life's changing circumstances" and the built environment, particularly aesthetics, can help with this. Resources fall under 3 categories: comprehensibility (e.g., easy wayfinding, design that makes clear the purpose of a space), manageability (e.g., accessibility concerns, outlets within easy reach), and meaningfulness (what makes life worth living) (e.g., spaces for social connections, connections with the natural world, spaces to reflect) (Golembiewski, 2022). Further studies are required to support salutogenic design and develop wellness indicators (Dilani, 2008).

Combining the principles of salutogenic and biophilic design, and using The Royal Children's Hospital in Melbourne as a case study, researchers tailored the restorative environmental design principles (influenced by the attention restoration theory from biophilia) for hospital settings. Restorative environmental design acknowledges that stressors deplete our resources through our lifetimes, especially in times of poor health. Soebarto and Abdelaal (2019) provide a framework of connection with nature that has a positive psychosocial effect on building occupants. Their approach brings together several theories, including attention restoration, generalized resistance resources, and psychologically supportive design to support facilitating human-nature connections within hospital settings and thereby other settings. This tailoring of restorative environmental design for hospital settings provides yet another excellent template that we can tailor to the post-pandemic design of library study spaces. This article provides figures and lists of studies for all positive impacts of nature/biophilic design including better sleep from natural light, stress relief from nature settings, improvements to productivity and reduction of boredom and fatigue from prospect and refuge elements, positive attitude and emotions from views of water features, anxiety reduction from hearing water fountains, and stress relief and a sense of wellbeing from gardening activities. It also gives examples for all 14 biophilic patterns and links them to the 4 human resources of restorative environmental design: physical, emotional, mental, and spiritual.

This exploratory research into pandemic impacts on adolescents, trauma-informed care and design, biophilic design, salutogenic, restorative environment, disease prevention, wellness-based and anti-anxiety design, has repetitively shown the importance of incorporating elements of nature, as well as opportunities for social connections and self-care, into the design of library study spaces. The lack of such in our current study spaces should give cause for concern, especially given the effects of the Covid pandemic.

The following is a long but not an exhaustive list of suggestions for all Dalhousie Libraries; it is intended to inspire further thoughtful considerations, particularly regarding biophilic and trauma-informed design as it relates to the fallout of the pandemic. Additional considerations should be given for increasing a sense of belonging, with considerations for equity, diversity, inclusion and accessibility. For convenience, I am basing the suggestions on the scenario of a Killam Library renovation. More recommendations are mentioned throughout this paper from the literature consulted, and in several instances, I've indicated resources that should be consulted during space design.

1) Of the 14 biophilic design patterns, I believe the following 5 are the most important for study spaces, based on the strength of research on their effects on stress reduction, cognitive performance and mood. In order of priority, and with customized suggestions:

   a) Provide a **visual connection with nature** via an indoor garden, single potted plants or other installations such as aquariums, terrariums with amphibians, ant farms, etc. Research shows these strongly improve levels of stress, attention and happiness.

   b) Provide for **prospect** – Also highly impactful, a broad view allows one to survey their surrounding environment. This is already achieved with the views into the atrium; however, atrium overhangs (or balconies), a third stair (these also provide social opportunities), and any broad view to the building's exterior would provide further effects of comfort and safety, and reduction of stress, boredom and fatigue. (Atrium overhangs would also provide for the patterns of refuge and risk.)

c) Provide a **non-visual connection with nature**, particularly through the presence of a water fountain or any movement of water that creates a sound (this is two patterns in one). This would reduce stress, improve cognitive function, memory and concentration, and elevate mood.

d) Provide places of **refuge** – e.g., placement of furniture in alcoves, partially enclosed cubicles, rolling white boards that can be used to create a sense of privacy/refuge where one can feel enclosed but with a view of the surroundings. Places of refuge allow users to feel safe and to concentrate better.

e) **Thermal and airflow variability** can be provided through windows that open – a longstanding request from students. This improves productivity and concentration.

(See Table 1 of Terrapin Bright Green, 2014, for references to studies that support the effects of these and the 10 other biophilic design patterns.)

2) Considering the salutogenic resources:

a) Comprehensibility should be examined via assessment studies – is the purpose of spaces clear, can students easily wayfind. For easy, independent wayfinding, a beacon-enabled app can be deployed to provide a self-guided tour experience, find more information on a particular space, locate available study spaces, find books in the collection, and more (see Lippincott, 2020).

b) Manageability can be provided by giving voice to students via student library committees and conducting human-centred design studies to support natural behaviours in study spaces.

c) Meaningfulness - the most intangible of the three resources - can be supported through staff-led or do-it-yourself mindfulness programs in makerspaces or the LINC classroom (see Coholic et al., 2020 and *Recognizing and responding to the effects of trauma*, 2015), green spaces that allow a user to spend time such as a meditation garden, home-like

settings, and a roof garden or interior gardens. The meditation room should be more visible, findable, recognizable and inviting.

3) For disease prevention:

   a) foot traffic should be limited throughout the building by designing self-sustaining spaces – those that include washroom facilities and water fountains, so occupants don't have to travel to other building locations.

   b) A to-the-desk food delivery service could also limit foot traffic.

   c) Special attention should be given to surface and furniture materials for easy cleaning and disinfection.

   d) Install automatic doors (touch-free).

   e) Increase use of hand sanitizers by placing them at eye level.

4) Green roofs, green walls, and other opportunities for students to redirect their gaze have proven attention restoration benefits.

5) The presence of plant motifs, wood and stone add further natural elements and natural analogues.

6) Maximizing natural light is repeated so much in the literature that it needs no further support. In addition to windows, light/windcatchers add to the "nature in the space" and also provide non-rhythmic sensory stimuli.

7) Offices with glass doors, open spaces with glass walls accommodate views into the rest of the building and help establish a sense of safety.

8) Displays of the human and geological history of the location of Dal campus (e.g., location of the original stream under the Killam, etc.) provide for a sense of awe.

9) Consider providing space and technology for digital forest bathing. See the Homeforest app for inspiration. *(Forest Bathing Recreated at Home with Smart Devices*, 2021)

10) Provide opportunities to actively engage with nature. Include onsite gardening or even bee-keeping activities, or gardening activities.

11) Enclosed outdoor areas that are extensions of the building itself with spaces to study.

12) Fabric designs and artwork that employ fractals with a scale of 3 and include nature motifs.

13) Provide trauma-informed service training for staff to both improve awareness and sensitivity to student trauma and be aware of one's own history of trauma. This can also aid in faculty/staff – student relationship building (see Spinelli, 2021).

14) Allow for personal customization of study spaces:

Low Tech: Allow manual manipulation of lighting, lend usb desk fans and ceramic warming stones (also provides the biophilic pattern of thermal variability).

High Tech: Use Alterspace (open-source code) and tablets that allow space users to customize light and sound for their current needs. (See Alterspace, n.d.)

15) Create opportunities for social connection and opportunities of peer-to-peer support:

Low Tech: Small whiteboards at each table (individual or group) where users may indicate what assignment they are working on and if they invite social interaction (this could be by colour-coding, etc.)

High Tech: An app that uses beacon technology and learning analytics so users can identify study space locations where other users attend the same classes or are doing similar research (see Lippincott, 2020).

16) Allow student input in design and in regular responsibilities for the buildings/spaces. Devise student-run committees that report to a library representative or to Library Council (e.g., design committee, health & safety committee, standing committee for each library).

17) Provide flexible seating arrangements in all spaces and easily moveable furniture but begin by placing most seats facing out from sheltering walls and cornered to avoid direct eye contact but to also allow for conversations.

18) Provide a mix of formal and less-formal (home-like) spaces but with furniture appropriate for work (similar to "working from home" settings).

19) Provide task lights for independent choice and customization.

20) Replace the red, yellow and orange paint colours with soft hues of blue, green and purple.

21) Lend fidget toys or place them in boxes along with sanitizing spay for easy retrieval and return.

22) Provide napping rooms/alcoves.

23) Test every seat for views of exits/exit signs.

24) Accommodate response to stress & trauma as well as healing and recovery by creating alcoves or private spaces for stepping away and practicing self-care.

25) For additional social considerations, display a large map (digital/printed) in a prominent area that pins where all the students are from, and student art exhibits in the foyer and other sharing/showcasing of student creativity.

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