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Neuroscience Educational Interventions For Mental Health Management Within The Neurodiverse Population: A Working Model

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Neuroscience Educational Interventions for Mental Health Management Within the Neurodiverse Population:

A Working Model

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NW Noggin

UNDERSTANDING EMOTIONAL SALIENCE

Our MEMORIES are formed through our EXPERIENCES.

The more *POWERFUL* something *FEELS* the *FASTER* and more *VIVID* the memory will be, whether POSITIVE or NEGATIVE.

(Tyng et al., 2017)
(Tourountoglou et al., 2020)

Social connectivity is an important aspect of learning for the young, developing mind and throughout adulthood as well. Memory is largely dependent on emotional salience, requiring attention *to* and engagement *with* information, making art a highly effective learning tool.

(Griesar & Leake, 2023) (Tyng et al., 2017)

Image by Michael Endicott, Art Teacher at North Middle School, Grants Pass, Oregon

INTRODUCTION

Humans are complex and multidimensional, thus a multitude of factors affect our mental health and wellbeing. Sociological and environmental factors, such as economic standing and cultural marginalization, hinder access to educational and medical resources. They are an inescapable part of life that must be taken into account in order to ensure sound pathological assessments, enable effective self-regulation and mental health management for neurodiverse individuals, and offset disparities in access to healthcare and education. Arbitrary attachment of social stigma to traits commonly associated with neurodivergence perpetuate harmful neuro-myths1 that have dire consequences when internalized, informing individuals' development and sense of self. The neuroscience outreach done by NW Noggin serves as a functional model for engaging communities with minimal economic resources and a greater need for social, educational, and communal services to supplement the disparities inherent to inequity.

Integrated arts programming, like those employed by NW Noggin, can help bridge the gap in resources within marginalized communities, affording participants and educators the opportunity to better understand the mind and body by asking specific questions that they want to know. Neuroscience educational interventions dispel harmful misinformation, enabling neurodiverse individuals, their practitioners, educators, social workers and family members to understand and better navigate neurodiversity. Through volunteer work and undergraduate thesis research, further inquiries are actively being pursued, via surveys, interviews, and holistic methods of fostering ongoing conversations with educators and students with a goal of determining the efficacy of neuroscience-based educational interventions in mental health management. Ongoing research on the efficacy of neuro-educational interventions in alleviating stigma surrounding neurodivergence to afford agency to those suffering from comorbid depression and anxiety.

- From an educational approach, a neuromyth was described as "a misconception generated by a misunderstanding, a misreading, or a misquoting of facts scientifically established (by brain research) -" (OECD, 2002).

NW NOGGIN EDUCATIONAL INTERVENTION MODEL

APPARATUS

Educational neuroscience materials were originally developed by the organization's founders, professors Jeff Leake and Dr. Bill Griesar of Portland State University (PSU), and are continually updated and expanded by the professors, PSU students and NW Noggin board members. They consist of the blending of biological information about the brain and nervous system as well as art projects designed to stimulate and engage students of all ages, with the underlying principle that by combining science and art, there is an increase in both learning capacity and engagement, strengthening the mind/body connection and encouraging informational recall (memory). The bulk of the material focuses on how the brain and body work together to inform perception and behavior, specifically addressing common misconceptions and "neuro myths", in order to both inspire curiosity and increase self-awareness and personal agency within the students. These materials are taken to schools across Oregon and southern Washington and are presented at schools, daycares, correctional facilities, and community centers under the guidance of professors Griesar and Leake.

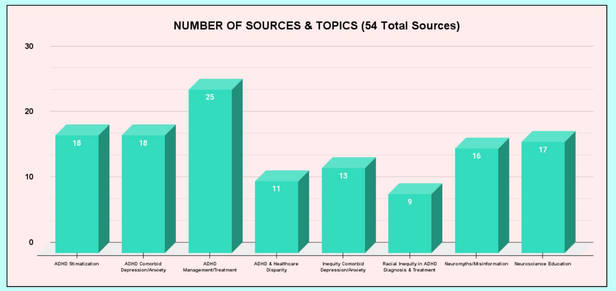
PROCEDURE

Booths are set up with several art projects, curated by Professor Leake and PSU students, that tie the neuroscience information into memory through visual and tactile stimulation. Various brains are displayed, available to both look at and hold, bringing tangible physical elements into the learning experience, which encourages deeper engagement with the material. The volunteers assist the participants in making model neurons out of pipe cleaners and gel prints (of which one of the models was my own design) while fielding questions directly from students. As the PSU student volunteer details their own academic point of focus and invites participants to engage in conversations about the neuroscience underpinning it. This allows volunteers to glean knowledge on specific areas of interest and helps NW Noggin assess subjects that require the most attention in further developing/updating the learning materials. For example, I begin each Q & A by telling students that I am neurodiverse and inviting them to share their experiences and ask me questions in relation to ADHD and autism. Any questions that I don't have answers for, I document, research, and respond by following up with staff at the school of origin. All of the curricula comes from current scientific research available from the National Institute of Health (NIH), the American Psychological Association (APA) and Creative Commons sources, and is updated routinely to ensure the highest level of accuracy and quality.

Educators are part of the process as well, assisting NW Noggin by pre-assessing student interest in particular subject matter prior to visits, organizing and aiding in setting up booths and decorations aimed at making the visits exciting and fun. Google form surveys are emailed to educators and students after visits in order to gauge the level of connection and interest in the outreach programming. Follow-up conversations (via email, video conferencing, in-person connecting and/or phone conferencing) between educators, volunteers, parents and participants further informs honing the neuroscience learning material. This is an ongoing, hands-on, largely qualitative research project, involving social factors that are not simple to quantify. Surveys from the schools/organizations, paired with demographic information from each, allow NW Noggin to gain insight into the effectiveness of the outreach, the results of which are overwhelmingly positive.

RESEARCH METHODS

I examined the most common methods for managing ADHD comorbid depression and anxiety by searching for relevant journal articles, both in direct relation to ADHD as well as independently due to the lack of research articles that directly address ADHD comorbidities, through the NIH, ResearchGate, PubMed, Google Scholar, Frontiers and MDPI databases and cross-referencing them using the following criteria;



CONCLUSION

Biological knowledge ***combats*** *misinformation*.

Neuroscience literacy can inform recognition, diagnoses and management of ADHD for individuals as well as the social support systems they are a part of.

There is a positive correlation between *stigma* surrounding ADHD and persistent mental health degradation in individuals with the diagnosis that can be alleviated through neuroscience literacy, changing the narrative to incorporate and accurately reflect scientific advancement.

Environmental factors that affect behavior and mental health must be taken into account for diagnosing and treating ADHD as well as comorbid mental health conditions in order to:

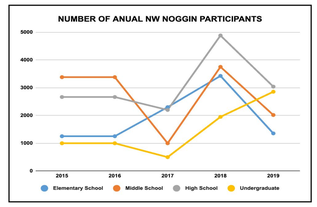
- Ensure accurate pathological assessments/diagnoses
- Enable effective self-regulation and mental health management
- Offset disparities in access to diagnoses, treatment and reliable healthcare

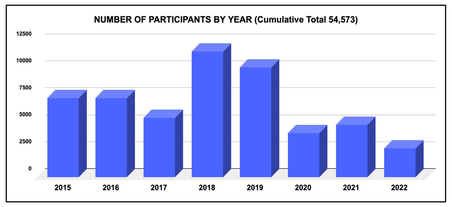
REFERENCES

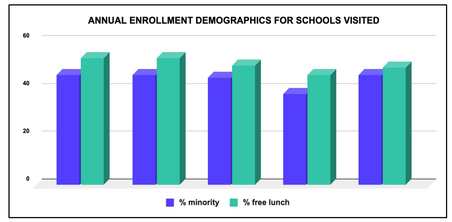
NW NOGGIN

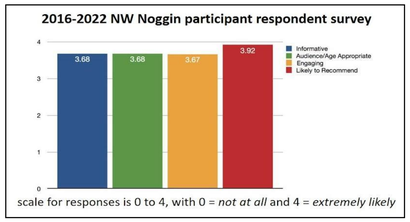
MCNAIR PROGRAM

NW NOGGIN PARTICIPATION DATA









LITERATURE REVIEW

STIGMA AND MENTAL HEALTH

The ADHD community is faced with a multitude of factors that don't apply to the neurotypical majority population. More than half of students with ADHD find being in the classroom environment emotionally burdensome due to social pressures from being different or "other than" neurotypical students. Social stressors, such as "othering", isolation and peer ostracization, which result from either symptoms of or a diagnosis of ADHD are among the highest reported factors in the development and/or exacerbation of comorbid depression and anxiety in the ADHD population (Godfrey et al., 2021)(Kellow et al., 2020). Though the causes and consequences of depression vary, having no single origin and being subject to a myriad of extraneous environmental, social and biological factors, the prevalence of persistent depressive symptoms comorbid with ADHD is indicative of a positive correlation (Antshel et al., 2013)(Crandall et al., 2019). The correlation between social isolation and depression has long been established, but studies into potential preventions, particularly for the ADHD and otherwise neurodiverse population, requires much further investigation, as it is a rapidly expanding demographic on the global scale which demands attention (Song et al., 2021)(French et al., 2020).

A national, cross-sectional study was conducted via anonymous surveys distributed across social media through networks of associations providing support for families with ADHD that was designed to measure behavioral, emotional and general cognition during the period of isolation during the global pandemic (Bobo et al., 2022). The survey was given to 583 families of children with ADHD and included closed-ended and open-ended questions addressing depression, ADHD, isolation, and coping mechanisms utilized during this time period. The study reported that half of the child participants in the study experienced emotional relief at being away from the social stigma of the classroom environment, while depression amongst the parents was significantly higher. A correlation was found between the mental health of parents and the mental health of their children, indicative of interrelationality, and was more prevalent in the older children and their parents.

A 16 year longitudinal study explored the potential link between depression exacerbating antisocial behaviors commonly associated with ADHD and affecting substance use (Nevik et al., 2020). 579 children with ADHD and 289 neurotypical children were recruited between the ages of 7 and 10 and followed into adulthood while self-reporting on their substance use, mental and behavioral health (Howard et al., 2019). There was no direct correlation found between persistent depression within the ADHD participants and an increase in substance use, except for slightly elevated reports of marajuana use, which the researchers posited as a potential medical treatment for ADHD comorbid depression in need of further scientific exploration. The study was conducted under the supposition that there was a positive correlation between those with ADHD comorbid with depression and elevated substance use, which turned out to be generally unsubstantiated.

BARRIERS TO TREATMENT

There are a variety of barriers to ADHD treatment that are both systemic and systematic in nature, the most prevalent being inequity and social stigma and prevailing cultural biases (Schoeman & Voges, 2022) (McAllister, 2020). Low-income, racial/ethnic minority and otherwise marginalized communities are hit the hardest by healthcare disparity (Cénat et al., 2020). Socio-economic issues, such as negative stereotypes and economic disparity, adversely affect mental health and wellbeing (Morrissey & Kinderman, 2020). Antisocial or problematic behaviors exhibited under duress are often erroneously attributed to symptoms of ADHD, without regard for the contribution of environmental stressors that inform behaviors of individuals while experiencing emotional distress. This literature shows that a lack of agency, whether due to internal biological, or external factors, can cause or exacerbate pre-existing depression and anxiety due to uncontrollable variables. In addition to general social biases, specific intercultural stigmatizations present further barriers to diagnosis, treatment, and resources for understanding and managing ADHD (Kellow et al., 2020).

A positive correlation exists between a lack of diagnoses of ADHD within racial/ethnic minority communities due to external variables such as economic struggle, residential isolation and segregation, and racial/ethnic biases within education and medical systems (Pennao et al., 2017) (Morgan et al., 2013). Gone unrecognized, symptoms of ADHD such as inattention or impulsive responsivity, are often assigned as personal or moral failings on behalf of an individual and/or their familial support system, which bring about negative internalized beliefs and hinder social and educational development during youth that reverberate throughout adulthood and often result in fewer resources and employment opportunities (Schoeman & Voges, 2022). Conversely, the arbitrary attribution of adverse social behaviors exhibited under duress to symptoms of ADHD while failing to take environmental factors into account (Cénat et al., 2020). Racial/ethnic minorities are underrepresented in ADHD research and reports of official diagnoses are far lower in these populations that do not align with symptoms of ADHD as they are reported by educators and guardians (Spencer et al., 2021)(Pond, 2020)(Cénat et al., 2020)(Pennao et al., 2017). This is a systemic issue, one that neuroscience education alleviates through informing not only individuals, but educators, practitioners, social workers, and family members about the biology of neurodiversity to improve accurate diagnoses and effective regulation of ADHD (Schoeman & Voges, 2022)(Pond, 2020).

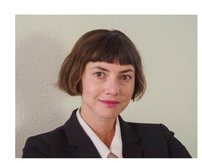
NON-PHARMACEUTICAL INTERVENTIONS

Although psychopharmaceutical intervention is the most prevalent type of treatment prescribed by practitioners, CBT and DBT are often prescribed supplementally, along with psychostimulants (Nevik et al., 2020)(Coughlin et al., 2015)(Otte, 2011). The prescription of psychopharmaceuticals can cause or exacerbate both depression and anxiety, due to negative associations with needing medication and the physiological responses to the medication itself (Al Ghriwati et al., 2017). Fear of medication is more prevalent in marginalized populations due to a lack of dialogue about ADHD outside of the negative connotations from social stigmatization, which is generally accessible through educational and medical resources that these communities have less access to (Spencer et al., 2021)(McAllister, 2020)(Coughlin et al., 2015). Neuroscience interventions can be used to build cognitive skills, providing tangible, physiological methods for managing symptoms of ADHD and comorbidities for those who have limited access to medical interventions, thereby supplementing healthcare disparity with education and reducing the risk of misuse due to overprescription or inaccurate diagnoses (Schoeman & Voges, 2022)(Spencer et al., 2021)(Slonim, 2014).

Less prevalent is the use of group therapies, which can include family, anonymous congregates, or peers in some capacity. Though studies on these social support intervention models are few and far between, they have the highest self-reported satisfaction rates and the lowest dropout rates (Spencer et al., 2021)(Al Ghriwati et al., 2017). It is also the only treatment method I found that offers a framework for racial/ethnic and disability specific support systems (Smith & Aaliyah, 2015). Peer support groups and social platforms for sharing experiences, while effective in engaging members of the ADHD community and fostering a sense of community, do a disservice to this population by spreading the same neuromyths on a broader scale, without the guidance of accurate science-based educational material (Yeung et al., 2022).

Art is a powerful tool within education, having the unique ability to engage multiple parts of the brain at the same time, embedding new information into existing mental frameworks for greater recall and a deeper understanding of subject matter (Gaetani et al., 2022)(Hardiman et al., 2009). Memory requires attention, engagement with subject matter and a narrative to tie new information into. Emotional salience is an intrinsic part of how we store and recall our experiences. The stronger the feeling during a learning experience, the faster and more vivid our recall tends to be (Crandall et al., 2019)(Tyng et al., 2017). Because of the extreme neuroplasticity of the mind during youth, and the time it takes for full hippocampal development which is largely associated with impulse control and mood regulation, memories from youth become the foundational framework for the rest of our lives (Roeckner et al., 2021).

ADVISORS & COLLABORATORS



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