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GENED 1038 Sleep

Final Capstone Paper

Dozing Off: Similarities in Symptoms of Sleep Disorders and ADHD

Inattention, hyperactivity, and impulsivity are some of the symptoms of Attention-Deficit/Hyperactivity Disorder, or ADHD. People with ADHD are often easily distracted, forgetful, prone to emotional outbursts, and have trouble holding attention for tasks. Similarly, attentional failures and impaired judgement are symptoms of sleep-related fatigue (Week 10 Lecture Concept 2) that stem from sleep deprivation or disorders. Sleep deprivation is often cited as a condition that deepens symptoms of ADHD; recently, however, there has been a large uptick in the number of people being diagnosed with the latter disorder. In this paper, we will explore the similarities in symptoms of sleep disorders and ADHD, as well as how they may interact with each other and contribute to the misdiagnosis of ADHD.

The first suggestions of ADHD dates back to Greek times. Hippocrates provided the earliest reports of a similar condition in 493 BC, where patients were described to have "... quickened responses to sensory experience, but also less tenaciousness because the soul moves on quickly to the next impression." This description evolved when German physician Melchior Adam Weikard described adults and children who were easily distractible by, overactive, and impulsive. Finally, the concept of ADHD appeared in modern terminology in France by Désiré-Magloire Bourneville who introduced "mental instability" in 1885. These created a more solid set of symptoms for what would eventually evolve into ADHD. In 1902, George Still finally conceptualized the first truly clinical set of symptoms for ADHD. The set of characteristics he defined was children who were "aggressive, defiant, resistant to discipline, as well as excessively emotional or passionate" and had problems with concentration and sustained attention. His lectures on observations of children would become the basis for future descriptions of the disorder. ADHD would eventually make its way into the Diagnostic and Statistical Manual of Mental Disorders, or DSM, starting from the second edition in 1968. It has

been described in every edition since then.

As of 2016, about 6.1 million U.S. children over the age of 2 had ever received an ADHD diagnosis, and of these, 5.4 million currently had ADHD. This is 89.4% of all children ever diagnosed, which demonstrates how recently ADHD has become progressively more common to diagnose. The percent of children with a parent-reported ADHD diagnosis has jumped from below 6% in 1997 to almost 10% in the late 2010s. The methods used for diagnosing ADHD have contributed to these trends, as well as the approval of medication as a treatment by the Food and Drug Administration (FDA) such as Bensedrine in 1936. The fourth edition of the DSM, or DSM-IV, has led to the largest jumps in diagnosis trends, and there is not enough information about the DSM-V to estimate percentages yet. A study also conducted around 2016 demonstrated that non-Hispanic black and white children were more likely to be diagnosed with these developmental conditions than Hispanic children. On the socioeconomic side, the percentage of children diagnosed with learning disabilities, including ADHD, decreased with higher incomes across all racial and ethnic groups. Even outside the U.S, many other countries report similar statistics for ADHD diagnoses, suggesting the prevalence of ADHD is as comparable in non-U.S. children as it is in children from the U.S. These all suggest that ADHD is a disorder affecting children beyond borders or ethnicities, similar to sleep disorders.

To diagnose someone with ADHD, one set of symptoms used is the DSM-IV criteria. This includes statements such as “is often easily distracted” and “often has trouble waiting one's turn” that patients grade themselves on, usually on a scale from 1 to 4. The Wender Utah Rating Scale (WURS) asks for patients to rate themselves using the phrases “Not at all or very slightly,” “Mildly,” “Moderately,” “Quite a bit,” and “Very Much” for a set of childhood symptoms that include “concentration problems, easily distracted,” “irritable,” “inattentive, daydreaming,” and “sad or blue, depressed, unhappy.” Multiple sets of criteria and scales are used to create a holistic and thorough exploration of all symptoms related to ADHD that psychiatrists and doctors then consolidate into the diagnosis. However, these scales have significant overlap between each other as well as with tests for other disorders. The self-reported nature of the

exams also brings into question the correctness and validity of diagnoses, so it is often asked for parents or peers of the patient to provide their own responses. For the most thorough examinations, patients are sometimes asked to visit a lab to be examined and given surveys in-person; these take three to four hours of testing and interviews. In general, each of the scales and exams attempt to categorize symptoms into a variety of ADHD sub-types. However, these are still not comprehensive as they do not provide an overview of a patient's lifestyle and especially the sleep patterns that may contribute to perceived symptoms.

The dangers of misdiagnosed ADHD are high, as treating sleep disorders with ADHD medication (and vice versa) can lead to prolonged symptoms and health problems related to the medications. The health and safety consequences of ADHD itself are varied; it foremost indicates a risk of school underachievement compared to cognitive ability. Additional conduct problems may emerge, including disciplinary problems, anxiety, and depression. Ek et al found that children with ADHD scored significantly under a control comparison group on a test, despite comparable IQ scores. Because the impulsive nature of those with ADHD often leads to poor decision making, danger-seeking behavior, and general behavioral problems, it is critical to create appropriate diagnosis and scales.

From a societal standpoint, college students with ADHD were found to have received more overall driving citations and license suspensions as compared to those without ADHD; these include a greater rate of car accidents. Males were found to be more aggressive and violent with partners, especially if they had conduct problems from childhood. Childhood ADHD is also linked to increased risks of alcohol abuse in adulthood as well as other thrill-seeking and impulsive activities. This includes higher sensation-seeking behavior in general, which is also a large symptom of ADHD.

On the other hand, misdiagnosing ADHD can lead to medicine abuse and persistent symptoms. Medicine abuse is a large problem, as ADHD is treated with amphetamines that further disrupt sleep. Currently, 25% of college students now use amphetamines as study drugs (September 21 Lecture Concept 5). The misuse of prescription drugs creates strain on the body and leads to the symptoms of ADHD to

persist, often leading doctors to increase dosage and creates a positive feedback loop. Additionally, if ADHD is misdiagnosed instead of sleep disorders, this also creates further issues with sleep. With sleep disorders not being diagnosed, patients will continue to struggle with issues such as sleep apnea, insomnia, night terrors, and more. Symptoms of sleep deficiency in children include difficulty focusing attention, emotional volatility and hyperactivity, and sleep disorders that go undiagnosed or misdiagnosed can be disastrous for the body (November 11 Lecture Concept 5). Because the symptoms of sleep deficiency and ADHD are so similar, it is crucial to understand how they may relate or interact in a patient to produce an accurate diagnosis. Attributing the symptoms of one disorder to the other can lead to further problems, which has far-reaching health and societal consequences. These dangerous behaviors are important indicators of the impact of ADHD and importance of appropriate diagnoses.

Significantly, all ADHD subtypes have been associated with increased rates of sleep problems, sleep disturbances, and boredom proneness. These include symptoms such as problems with circadian rhythm, sleep-talking, nightmares, and hypersomnia. Patients often experience insomnia, night terrors, and snoring. Sleep deficiency and disorders were also found to exacerbate the standard problems with attention and impulsivity associated with ADHD. A high proportion of ADHD subjects had complaints of excessive daytime sleepiness, poor sleep quality and fatigue, and their sleep quality and daily fatigue were higher than for those not diagnosed with ADHD. There were additional symptoms and problems across the different subtypes. Chiang et al argued that their findings implied that the approach to diagnosing the disorder must be altered to consider the association with sleep problems and disorders.

One attempt to understand the interaction between ADHD and sleep disorders is described in a study by Keshavarzi, et al. They pointed out that “successful management of sleep problems in ADHD is substantially hampered by the fact that the actual nature of sleep alterations in ADHD patients is still poorly understood.” Additionally, there are not many sleep studies looking into the impact of altering sleep hygiene in children and adolescents with ADHD, and especially on their emotional and social experiences after focusing on improving sleep lifestyle. During the study,

researchers trained and monitored 20 parents of children diagnosed with ADHD specifically in regulating and supervising their sleep schedules. Another set of 20 parents of children with ADHD and 20 parents of children who were healthy only received general information about sleep hygiene. Both sets of parents completed questionnaire at the beginning and at 12 weeks into the study related to their children's sleep and psychological functioning. The parents of the first set, who were thoroughly trained in improving their children's sleep, described large positive impacts in the children's emotions, behaviors, and social lives. They reported that their children improved in physical and psychological well being, mood, emotions, relationships, and social acceptance.

This study's success demonstrates that tracking children's sleep and implementing interventions to improve the sleep was effective in improving executive functioning, suggesting a link between ADHD and sleep disorders. The researchers pointed out that children with ADHD often have siblings also diagnosed with ADHD, indicating that an ADHD diagnosis may actually be related to family dynamics, which has a large impact on sleep and psychological functioning. However, it is difficult to implement a long-term diagnosis system for ADHD that includes clinically studying sleep. This study necessitated a training module, where parents were trained in sleep hygiene and persistently improved their children's sleeping behaviors. Additionally, the study took over 12 weeks to complete, as this was the amount of time from the baseline questionnaire to the 12-week survey. Using a similar study when officially diagnosing a patient would be difficult and almost impossible to implement.

None of the scales or surveys described prior include information about sleep habits or problems, which is a significant gap in information, given how impactful sleep habits are on how ADHD symptoms manifest. Sleep has an incredible impact on how ADHD affects patients, and may be misdiagnosed as well. This contributes to the problem of ADHD being misdiagnosed or confused with sleep problems.

One solution is to create a more holistic diagnosis of ADHD that includes sleep tracking by the patient, which can lead to information useful in diagnosing and treating ADHD. Specifically, when a patient pursues an ADHD diagnosis, this currently includes

surveys and interviews for both them and people who know them well in a process that often already takes several weeks. Personal sleep tracking is one solution that can allow psychologists and therapists more holistic information regarding how a patient's symptoms may arise and manifest. For example, if someone's symptoms may seem very similar to a sleep disorder, having sleep tracking information can help avoid a misdiagnosis and allow the patient to receive more accurate treatment. If a patient's ADHD includes a large sleep disorder component, this can help them manage the disorder better.

This type of diagnostics would possibly shorten the timespan from the 12 weeks described in the study to two weeks of sleep tracking, when the patient would most likely be filling out the self-report scales anyways. Some important information could be that similar to the surveys conducted in class (November 30 Lecture Concept 2). This includes time to bed, time to wake, sleep latency, and nap times during the day. This information is important as people with ADHD are noted to go to bed late and wake up late, as well as be more prone to taking naps throughout the day. Additionally, collecting information about grogginess and irritability at sleep and wake times may indicate more symptoms of either ADHD or sleep disorders. By producing a holistic diagnosis incorporating sleep and lifestyle information, psychiatrists and clinicians can see how problems in one area may contribute to exacerbated symptoms and possibly be more relevant in a diagnosis than executive functioning disorders. These can also help patients understand how their lifestyle contributes to the observed symptoms and make the correct changes. By improving diagnosis, this leads to less medication abuse and better executive functioning.

For even more accurate diagnostics, the clinics that require patients to undergo tests and observations can incorporate a sleep component as well. This can ensure that patients receive adequate sleep prior to examinations and in-person programming, which would encourage clinicians to be more secure in their diagnosis. Currently, patients with sleep disorders may struggle to get enough sleep the nights before an ADHD diagnosis, which contributes to the misdiagnosis further. If the lab and patient themselves are sure that they received enough sleep for an accurate diagnosis, this allows

them to get a truly comprehensive diagnosis. However, this is more unwieldy and less possible as overnight stays in clinics tend to be expensive and harder on the patient to carry out.

To implement the primary solution of holistic lifestyle diagnostics, we would need an additional survey or metric containing those symptoms that are common to both ADHD and sleep disorders, as well as some specific to both. This would then have to be tested on patients of all groups, control subjects with no disorder, patients who have been diagnosed with ADHD, some that have been diagnosed with sleep disorders, and some with both. The results from these can indicate how many patients from each group suffer from which problems. Finally, we can take the survey results and iterate on them repeatedly to create the final set of symptoms, creating a better mechanism to track sleep that can be used in ADHD diagnoses.

For the timeline, creating the preliminary survey would take a year. It would be necessary to first compile all of the heuristics used in diagnosing ADHD and all of the heuristics for diagnosing sleep disorders. Then, the overlap would be extracted to see which symptoms are similar to both problems. Additionally, different symptoms relate to different ADHD subtypes, so comparing those subtypes and seeing which are most similar to sleep disorders would help to create more accurate diagnostics. Finding all of these different statistics would take a longer time as it would require some data analysis by psychiatrists and doctors experienced in both areas.

After finding the different symptoms, creating the survey would take three to four months. This would be several different surveys, similar to how ADHD is currently diagnosed, but including both ADHD and sleep disorder-specific surveys as well as blended exams. Because these would be used on humans, it would probably be necessary to present them to a human-use ethics committee and have them approved. This process can take several iterations, so another 6 months should be allocated to this stage. Generally, creating the surveys and approving the experiments could be expected to take another year.

Finally, finding the appropriate subjects and giving them the exam would take another couple years. It would be necessary to repeatedly revise the survey and

diagnostics to get accurate readings, lengthening the process. Additionally, it is possible for this stage to extend indefinitely, with repeated iterations. Finally, the information must be used in finally understanding what heuristics are necessary to track sleep and its relation to ADHD.

One barrier to implementation is creating the preliminary surveys, as well as understanding the feasibility of asking patients to track their sleep. A potential workaround would be using current ADHD scales and surveys as a baseline, and add and remove points until it is more sleep-specific. This can stem from using the original ADHD and sleep scales as a source of symptoms in building the final diagnostics as described in the solution.

Overall, ADHD and sleep have very similar symptoms that contribute to their interactions and misdiagnosis. Sleep exacerbated and heightens observed symptoms of ADHD, and improving sleep hygiene can lead to better executive functioning. By creating a new set of diagnostics that incorporates lifestyle and sleep tracking information, a better system for understanding and diagnosing ADHD and learning disorders can be developed.

Citations

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