Have We Been Thinking About A.D.H.D. All Wrong?

Paul Tough's feature article in the NYT (2025-04-13) is bound to have an impact. This is an interesting feature article replete with thought-provoking information for practitioners, scientists, affected people, and policy makers.

Tough's general thesis is that ADHD diagnosis and treatment "rest[s] on certain assumptions: that A.D.H.D. is a medical disorder that demands a medical solution; that it is caused by inherent deficits in children's brains; and that the medications we give them repair those deficits". He claims that we have only recently discovered that each of these assumptions is incorrect and that we ought to replace current invalid assumptions about the cause and treatment of ADHD with a *revolutionary* new approach to the ADHD based on environmental causes. Tough argues that ADHD is overly and incorrectly diagnosed because we lack diagnostic tests and valid measures of the disorder.

Tough describes the recent and rather dramatic increase in the prevalence of ADHD and people taking stimulant medication, the limited benefits and apparent risks of stimulant medication, the trait-like nature rather than clear-cut boundaries of ADHD, the frequent co-occurrence of ADHD with other mental and physical health conditions, the role of environmental risk factors, fluctuations in the course of ADHD as people get older, and changing diagnostic criteria. Rather than being revolutionary new ideas, each of these facts are well known to reasonably knowledgeable mental health practitioners, researchers and policy makers. After reading this article, one might reasonably wonder why anyone would make or seek an ADHD diagnosis, consider ADHD a real condition, or prescribe or take stimulant medication. In his eagerness to present this revolutionary new theory and approach to ADHD, Tough glosses over some key facts that would be of interest to NYT readers.

It is true that prevalence has increased and community and professional attitudes toward ADHD have changed markedly with far more acceptance of the diagnosis and apparent enthusiasm for stimulant medication over the last few decades. Tough considers that the current rate of ADHD far exceeds "…what many people expected" without explaining how he established this accepted rate. This statement implies that the current prevalence of ADHD is too high. Keep in mind that in the 60's people claimed that children never got depressed or suicidal. Secular trends in mental health traits is an established phenomenon. Tough implies that ADHD is being diagnosed when people do not meet criteria for the disorder and inappropriately receiving medication. Tough does acknowledge that there are other factors at play in this increase in prevalence. There is far greater awareness among patients and practitioners of the impairment that results from inattention, restlessness and impulsiveness. Tough deals nicely with another reason for increased prevalence, namely the trait-like nature of ADHD. Early revisions of the DSM struggled with defining the disorder so as to include only those with the most serious

impairment to find that those with only slightly fewer symptoms might be just as seriously affected. Revisions in diagnostic criteria tried to keep up with this evolving story. Despite what some experts say (Tough quotes Wes Crenshaw in this article who seems to think that ADHD is a category with distinct boundaries that are simply established in practice), ADHD is a trait akin to blood pressure rather than a categorical diagnosis like TB. Either you have it or you don't is not an approach that fits recent or established evidence about ADHD or currently recommended approaches in mental health. We have known for a very long time that ADHD is quantitative in nature (Lee et al., 2008). There is a clear correlation between the severity of ADHD traits and the severity of cognitive deficits, number of genetic risk variants, variation in brain volume and activity and other features (Crosbie et al., 2013a; Zarrei, Burton, Engchuan, Higginbotham, Wei, Shaikh, Roslin, MacDonald, et al., 2023). There is no natural category of "people with ADHD" just as there is no natural category of people with hypertension. Genetic, neural, and cognitive studies indicate that the relationship of risks to ADHD trait severity is linear (Brikell et al., 2021; Crosbie et al., 2013b; Demontis et al., n.d.; Larsson et al., 2012). In other words, ADHD is more like a continuous quantitative trait in the general population than a category. Consequently, children who do not meet full criteria for an ADHD diagnosis may have subthreshold ADHD. Those with subthreshold ADHD exhibit significantly higher family dysfunction, cognitive impairment, executive dysfunction, interpersonal and school deficits, temperament problems, psychiatric comorbidity, and juvenile delinquency than children with no ADHD symptoms (Bhide et al., 2024; He et al., 2024; Kirova et al., 2019). Tough correctly points out that the trait-like nature of ADHD does not invalidate it. What he does not point out is that practitioners spend considerable time assessing the severity of ADHD traits and associated impairment as part of their assessments. None of this is new information or an insight that would shock anyone who has practiced or done research in this field. The same can be said for many mental health problems such as autism, schizophrenia, depression and anxiety as well as many physical health concerns such as blood pressure and obesity. Rather than indicating uncertainty about the existence of ADHD, changing diagnostic criteria reflects an effort to define those most in need.

Tough points out that a substantial portion of the increase in ADHD prevalence arises from telehealth assessments and prescription of medication which increased dramatically during COVID and which have been turned into a thriving business in USA and to a lesser extent in Canada (Danielson et al., 2024). The surge in use of telepsychiatry has intensified concern about the quality of diagnoses, treatment monitoring, the potential for substance use, non-medical use of stimulant medication, and diversion (Hong et al., 2024). To be sure, care that does not meet current clinical practice guideline standards is an issue that we should all be concerned about. The quality of assessment and care in the actual or virtual office is the focus of clinical practice guidelines published by multiple organizations including CADDRA. The focus

on quality should lead to conclusions about resource allocation, training, and health-care costs rather than decisions about the validity of ADHD.

In what is likely to be the most controversial aspect of the article, Tough argues stimulant medication does not deliver long-term benefits in ADHD symptoms or in scholastic achievement and cause serious side-effects. Short-term benefits are well established, uncontested and not challenged by Tough or cited authorities. Tough's conclusion is based largely on evidence from long-term follow up assessments of people who participate in the MTA study, the largest and best randomized control trial of ADHD treatment. MTA participants clearly benefitted from stimulant medication over the initial 14 months in the randomized control trial but benefit was far less after longer periods of treatment (MTA participants were followed for many years). Moreover, there was evidence that stimulants impacted height. Tough concludes that we ought to change our approach to treatment based on this evidence. There is much that has been omitted from this argument. Systematic reviews of stimulant effects on height and weight have concluded that there is evidence for an impact on height and weight, that there is need for further research, but that the effect of stimulants on height are small and can be mitigated by using lower doses and providing breaks from treatment (Baweja et al., 2021; Carucci et al., 2021; Vater et al., 2023).

Tough might have added that high quality care for those with a diagnosis of ADHD involves regular follow up to monitor the continued need for medication and to administer non-pharmacological care as appropriate. The article treated short-term benefit from stimulant medication as inconsequential. Doctors treat many conditions with treatments that have very significant adverse effect and fail altogether after some time. A practitioner's responsibility is to assuage human suffering in whatever way we can while minimizing harm. Paradoxically, Tough cites experts who think that the lack of benefit is the reason why patients often stop taking medication at the same time there is increasing demand in the community for access to medication.

Tough quotes Swanson extensively on the apparent lack of benefit of stimulant medication on learning or academic achievement. Simply paying attention does not translate into immediate gains in new learning. Stimulants reduce restlessness, inattentiveness and impulsiveness especially in the classroom, improve social interaction, increase self-esteem and improve family relationships. Although stimulants have limited demonstrated impact on scholastic attainment, they do have a marked impact on the cognitive skills such as inhibitory control and working memory that are key to scholastic success. There could be several reasons for this paradox. Research shows that the dose of stimulant medication that optimized cognition is lower than the dose that optimized behavior in many children. Carefully supervised titration of medication is covered in all clinical practice guidelines (see CADDRA). Another reason why stimulant

medication might not improve scholastic attainment could be the high rate of associated learning disabilities among those presenting for care for ADHD. This is not new information and is an argument for better assessment of drug effects, closer monitoring and extensive follow up care. It is not an argument for giving up on stimulant treatment or ADHD, but rather an argument for improved access to psychoeducational assessment, better teacher training and in class support. Many of us have argued that all patients with a tentative ADHD diagnosis should have a psychoeducational assessment to identify concurrent learning disability.

It is incorrect to imply that biological research into ADHD has been unhelpful and that revolutionary ideas about ADHD and its treatment should focus exclusively on environmental factors. It goes without saying that the distinction between biology and environment is specious and unhelpful. Traumatic brain injury is a good example of why it is necessary to consider both biology and environment simultaneously. About 25-50% of children who suffer traumatic brain injuries exhibit ADHD (R. J. Schachar et al., 2015).

Nevertheless, the fact that environmental factors contribute to the etiology of ADHD is far from novel and was acknowledged in the 19th C (R. Schachar, 1986). Twin studies show that about 30% of the variance in ADHD is a result of environmental risk factors, but that the majority of variance is attributable to genetic influences. Environmental risks factors can arise within families such as parenting quality, experience of maltreatment, parental relationship status such as divorce and single parenting, parental incarceration, and child media exposure are associated with ADHD or in the physical environment such as exposure to lead or cigarette smoke (Claussen et al., 2024; Kim et al., 2020; Kleppesto et al., 2024). None of these environmental risk factors that have been identified to date are exclusive to ADHD and, each one contributes only a small amount of risk in the population although they could be important an individual person. Because of their small effects, no environmental risk factor presents a reasonable target for public health intervention. Nevertheless, environmental factors that influence mental health should be assessed and treated in the context of ADHD care. It is not either or, but both. Supportive family relationship during adolescence and having a sense of what you plan to do in the future when you graduate from high school are key determinants of adult mental health. Keep in mind that the MTA study showed little benefit from an intensive non-pharmacological treatment in the first year and recent reviews find that non-drug interventions are less effective than drugs (Peterson, Trampush, Maglione, et al., 2024).

Tough states that “difficulty sitting still and sustaining attention can be symptoms of a serious head injury, fetal alcohol syndrome, childhood lead exposure, early trauma and more.” This is true. What Tough does not state is that these factors are uncommon explanations for ADHD. Moreover, some of these factors such as serious head injury does not preclude other causes for ADHD for example interaction between genetic and environmental risk factors. Also keep in

mind that stimulant medication can improve ADHD symptoms even in the presence of another mental or physical health condition such as traumatic brain injury.

The fact that there is a high rate of overlap of ADHD with other disorders is correct. The article is silent on why this might be the case. Tough cites the overlap of ADHD with other disorders to invalidate the ADHD diagnosis. But ADHD and other disorders can co-occur because they share underlying risk factors such as genetic risks or neurocognitive deficits or because one disorder leads to the other. Shared genetic risk contributes to the co-occurrence of ADHD, many physical health conditions and premature death. This is an argument in support of ADHD as a valid entity.

The article states that "... D.S.M. specifies that clinicians shouldn't diagnose children with A.D.H.D. if their symptoms are better explained by another mental disorder, more than three quarters of children diagnosed with A.D.H.D. do have another mental-health condition as well, according to the C.D.C.". In fact, DSM-5 states that an ADHD diagnosis can be made when symptoms "...cannot be explained by another disorder such as a mood or anxiety disorder." It does not say "another mental-health condition" as Tough states. DSM-5 allows multiple diagnoses such as ASD and ADHD. It is true that anxious or depressed children can appear restless, inattentive and impulsive. A thoughtful clinician would note this presentation. But it is equally or more often true that children experience depression or anxiety because of (not instead of) their ADHD. A careful history and treatment trials can be helpful in sorting out these comorbidities. In fact, concurrent disorders are the rule rather than the exception when it comes to ADHD and other mental health conditions. Hierarchical diagnostic strategies have not proved to be superior to phenomenological ones and tend to minimize associated features that could benefit from treatment. People with Tourette syndrome and ADHD benefit from stimulant treatment. In fact, trait-based nosological systems are considered viable alternatives to categorical diagnoses in clinical practice and research.

Tough points out that practitioners have a hard time measuring ADHD symptoms in any objective way and rely heavily on questionnaires. This is true. Tough does not point out that all mental health traits (and many physical health traits such as pain) are difficult to measure objectively and therefore require expertise and experience on the part of the practitioner and careful interviewing.

Tough states that there are no biomarkers of ADHD. This statement is incorrect. Tough does not distinguish biomarkers from diagnostic tests. Diagnostic tests must have high sensitivity and specificity to be useful. A good diagnostic test should tell you who is affected and who is not. On the other hand, biomarkers are indicators of mechanism. There have been extensive studies of cognition (inhibition, working memory, cognitive flexibility), brain structure and function, genetics, and electrophysiology biomarkers. As Tough correctly states, none of these measures

serve to diagnose ADHD because none has sufficient sensitivity and specificity (see recent extensive review by AHRQ and Peterson et al. (Peterson, Trampush, Brown, et al., 2024)). However, many traits are reliable and stable characteristics of ADHD (biomarkers) although the relationships are insufficiently strong to allow diagnosis. For example, meta-analyses show that deficient response inhibition (the ability to stop a speeded response like a check swing in baseball) is a significant deficit in ADHD (Lipszyc & Schachar, 2010). Many of these are replicable biomarkers. Family and twin studies consistently estimate the heritability of ADHD as 74% for both ADHD traits and categorical diagnoses (Faraone & Larsson, 2019). Molecular genetic research identifies multiple associated rare and common genetic variants in ADHD. These variants affect risk genes expressed in the frontal cortex, in neurons and during early brain development (Lionel et al., 2011; Schachar et al., 2017; Zarrei, Burton, Engchuan, Higginbotham, Wei, Shaikh, Roslin, Macdonald, et al., 2023)(Dsemontis, Walters, Athanasiadis, Walters, Børglum, et al., 2023). There is considerable overlap among the genetic, neural and environmental risks found in ADHD and those found in other psychiatric, physical health conditions or traits such as body mass index (BMI), smoking, insomnia and educational attainment, diabetes, migraines, chronic obstructive pulmonary disease, type 2 diabetes, lower overall health, younger age at first sexual intercourse, age at first birth, a history of physical maltreatment, increased risk taking-behaviour, smoking in the home, and risk of premature death (Dardani et al., 2021; Du Rietz et al., 2018; Garcia-Argibay et al., 2022; Haan et al., 2024; Hegvik et al., 2022; Riglin et al., 2021; Schiavone et al., 2022). Studies of the brains of affected individuals find that ADHD is associated with smaller hippocampal (an area involved in memory, learning and spatial navigation) and intracranial volume than typically developing control subjects and those with other mental health conditions (Boedhoe et al., 2017).

Tough is correct that no single genetic, neurocognitive, or other risk factor or small subset of risks predicts ADHD with adequate precision for clinical purposes. ADHD seems to be a result of many genetic and environmental risks. Current estimates suggest that there may be over 7,000 common variants collectively explaining 90% of its SNP heritability (Demontis, Walters, Athanasiadis, Walters, Therrien, et al., 2023). Practitioners are left to sort out valid from invalid diagnoses in the absence of a reliable and valid diagnostic test, extensive comorbidity and overlapping etiology.

So have we been thinking about ADHD all wrong? For many people the answer might be yes, but for most CAP, clinical psychologist, and appropriately trained mental health professionals, the answer is no. If you were thinking that ADHD was a distinct entity that could be distinguished from non-ADHD using any one (or a combination) of measures (neuropsychological, rating scale) and that stimulants were the sole established life-long treatment for ADHD then you will conclude that the answer is yes, you have been thinking about ADHD in the wrong way. If you have been following the literature on ADHD, were trained

in psychiatry over the last few decades or are following current clinical practice guidelines, then there is little in this article that would lead you to conclude that you have been thinking about ADHD in the wrong way .

The Tough article hints at but does not discuss several critical issues in the field of ADHD. Many people with ADHD have had no or limited access to *quality* assessment or care. For these individuals, telehealth is an attractive alternative to an endless waitlist despite the fact that care might well be inadequate, short-term or expensive. Many, possibly most, primary care physicians have had little training in how to assess and care for people with ADHD. Yet their patients ask them about ADHD. NICE guidelines in UK categorically state that ADHD should be diagnosed and treated only by psychiatrist who are practicing in the context of special mental health clinics where wrap-around, biopsychosocial care over the lifespan can be offered. This is an unrealistic aim at the moment with limited immediate policy implications. In Canada, we believe that better training and support for community physicians is an important public health strategy.

ADHD has been trivialized even in the psychiatric community. There is a lack of resources in the psychiatric communities for care of people with ADHD. This service gaps is going to grow as more people seek assessment and care for ADHD-like symptoms in older age. It is not easy to assess for or treat ADHD just as it is not easy to assess or treat other mental and physical health concerns. Medicalization of variation in physical and mental health has always played a role in attitudes toward ADHD as with other conditions and other human characteristics c.f. intelligence. Often the true nature of a problem becomes clear only after some period of continuous care. But it is a trait that is impairing in many individuals and which confers risk for the development of other mental and physical health conditions. Patients require long, not short term care, reassessment of the effects of treatment and monitoring of adverse effects of treatment. ADHD is not a single thing. It likely varies in etiology, course and treatment. You diagnose disorders, not people.

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