Advocating for Routine ADHD Screening in Young Girls

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Abstract

Objective: Attention Deficit Hyperactivity Disorder is a pervasive neurodevelopmental disorder among children. Research has shown that young girls are underserved in diagnosing and treating ADHD or never diagnosed compared males. Utilizing the Health Promotion Model, this project aims to determine if primary care providers are aware of sex differences in ADHD and if a brief education on sex differences in ADHD affects the primary care setting's screening rate.

Design/Methods: With the Arizona institutional review Boards' approval, primary care providers (PCP) in a Southwest family practice in Arizona (n=35) are provided with virtual education on sex differences in ADHD. Pre- post-intervention surveys were electronically administered to five PCPS. Data were deidentified. A two-tailed paired t-test was conducted to examine the mean difference of responses.

Results: Analysis of responses demonstrate that primary care providers are well aware of sex differences in ADHD but screened less for ADHD before the education intervention. Major themes emerged from provider comments on ADHD symptom recognition, time constraints, and increased screening to identify girls in the primary setting. A significant increase in ADHD screening is seen four weeks post-intervention $t(4) = -6.32$, $p = .003$.

Conclusion: Future research is needed to identify other factors that could strengthen ADHD screening during well-child visits overall. Also, the use of a pediatric screener which can highlight inattentive symptoms would assist in the process of identifying girls with ADHD.

Keywords: Attention Deficit Hyperactivity Disorder, primary care providers, girls, identification, screening.

Advocating for Routine ADHD Screening in Young Girls

Attention Deficit Hyperactivity Disorder (ADHD) has drawn significant public attention over the last 35 years. As one of the most common diagnoses found in young children, it is still underdiagnosed in girls. (Madsen et al., 2017). Symptoms of ADHD are seen in early childhood and interfere across many settings in a child's life. ADHD is a complex neurodevelopmental disorder, which may have a significant impact on a child's life. In ADHD, there is more than impairment of attention span, excessive impulsivity, and over-activity. Children with ADHD may often have several co-existing disorders. For example, children with ADHD may often suffer from depression, anxiety, conduct disorder, oppositional defiant disorder, obsessive-compulsive disorder, and substance abuse disorder (Madsen et al., 2017). The undiagnosed and untreated ADHD cases face a significant chance of poor life outcomes if an early diagnosis isn't present.

Problem Statement

It is understood that undiagnosed and untreated ADHD is associated with an increased risk for poor life outcomes, especially when the condition is diagnosed late in life. The effects of ADHD can place a child at an increased risk for other psychiatric disorders, educational and work failures, addictions, and even premature death (Overgaard et al., 2018). The Centers for Disease Control and Prevention report that boys are more likely diagnosed with ADHD than girls (12.9% compared to 5.6%) (CDC, 2016). Self-report surveys show that ADHD is equal in prevalence among sexes (Banaschewski et al., 2018). Symptom presentation of hyperactivity and aggression in males may explain the prompt identification and early intervention for ADHD in boys. In young girls, ADHD may present as being talkative, overly friendly, or even quiet and shy. Often, parents and school staff may overlook these behaviors because they're considered

normal behaviors among school-aged children. On average, girls with ADHD are diagnosed over five years later than their male counterparts (Walters, 2018). The difference between ADHD and normal behaviors is centered around the frequency of inappropriate behavior. Since girls with ADHD are not known for inappropriate activity, they tend to go undiagnosed. Research shows that unidentified cases of ADHD in females could lead to self-esteem issues, anxiety, and later depression (Overgaard et al., 2018)

Purpose and Rational

Introducing ADHD screening as a standard of practice during pediatric well-care visits could improve early detection of ADHD in young girls. More research is needed to understand the trajectory of untreated ADHD in women; therefore, identifying the symptoms at a young age could positively shape the unknown. The purpose of this paper is to understand gender differences in ADHD and find an intervention for identifying ADHD in girls to improve the processes of early detection and early intervention.

Background and Significance

The first reliable evidence of ADHD came from a primary care practice in England during the 20th century. Pediatrician Sir George Still introduced his findings of ADHD as a peculiar defect of moral control in children (Singh et al., 2016). Researchers of a recent meta-analysis calculated worldwide ADHD prevalence to be 7.2%, and from community-based samples, prevalence might be as high as 15.5% (Wolraich et al., 2019).

Cost of ADHD Treatment

ADHD poses a high cost to the healthcare system. When we look at direct care cost, hospital stays, home care, ambulatory care, and prescription drugs cost are all accounted in the expenditure for children with ADHD (Gupta-Singh et al., 2017). Gupta-Singh et al., (2017)

asserted that spending for ADHD among pediatric patients was an estimated $3.3 billion in 1996 and $12.6 billion in 2008. Researchers today estimate that in the United States, $31.6 billion is the combined annual cost for people with ADHD (CDC, 2016). Early assessment and intervention of ADHD could alleviate some of the healthcare costs associated with this disorder.

Population

Teachers and parents often miss the warning signs of ADHD in girls as they are more likely to be disorganized, have anxiety or low self-esteem, and eventually major depression (Wolraich et al., 2019). Unfortunately, failing to recognize ADHD in girls allows them to miss out on well-studied medication treatments, therapies, and academic services. An estimated 4 million women are affected by ADHD and remain undiagnosed (CDC, 2016). Recognizing the manifestations of adult ADHD can be daunting; therefore, it becomes critical to capture the diagnosis during childhood. Many women present to their provider's office with less apparent symptoms of ADHD and tend to appear with inattentive behaviors. Inattentive symptoms of ADHD may appear as forgetfulness, internal anxiety, and restlessness (Walters, 2018). These behaviors are usually invisible to primary care providers, and misdiagnosis occurs. Misdiagnosis of ADHD occurs when providers negate a complete psychiatric history. They focus solely on the external instead of internal symptoms commonly associated with women with ADHD (Quinn et al., 2014). For example, A patient with dysthymia presents with two or more symptoms of depression for at least two years, and this low mood is often comorbid with ADHD and becomes the primary diagnosis (Quinn et al., 2014). Providers may no longer look for a differential diagnosis because, technically, the patient may have dysthymia. An accurate diagnosis of ADHD calls for a clear understanding

of psychiatric history, family psych history, and a provider's understanding of sex-specific symptoms in ADHD.

Internal Evidence

In the United States, millions of children have been diagnosed with ADHD. Still, millions of girls are unaccounted for. The American Academy of Pediatrics (AAP) recommends that primary care providers become familiar with the assessment, diagnosis, and treatment of ADHD. In a primary care practice facility in Phoenix, Arizona, they currently do not routinely participate in the screening for ADHD. Some providers are unaware of the tool used to assess for ADHD, and current practice for screening is completed upon parent request. The providers that screen for ADHD use the Vanderbilt assessment tool. This tool assesses children from ages 2-17 years old. A statistical program called Tableau is used to track all screenings and positive testing, but at this time, the data on ADHD is not regularly used for metrics. ADHD screening is of such importance in young children, given this is a time where children develop intellectual, expressive, and social skills that affect long-term psychosocial and academic outcomes (Walters, 2018).

Intervention

Refining the diagnostic process to identify ADHD earlier in children is essential; therefore, utilizing short screeners during routine checks up and yearly physicals becomes necessary. Understanding gender differences in mental health is also a crucial component for screening ADHD. Limited recognition is one of two critical barriers to diagnosing ADHD in primary care, and the second is low confidence among providers (French et al., 2020). In a systematic review analyzing primary care providers' understanding of ADHD and recognition, the study found a need for education and resources (time) (French et al., 2020). These issues

present as an obstacle to screening and diagnosing ADHD in the primary care setting. To improve primary care provider confidence in diagnosing and treating ADHD educational interventions are needed.

PICOT

This inquiry has led to the PICOT question, in young females in the primary care setting (P), how does the addition of an ADHD screening tool (I), versus treatment as usual (C) improve early detection of ADHD? (O)

Search Strategy

The literature review included a comprehensive search of the most current evidence to address the PICOT mentioned in the above question. Three databases are reviewed for primary research, and they are Cumulative Index of Nursing and Allied Health Literature (CINAHL), PsychINFO, and PubMed. The search criteria are directed towards screening for ADHD in children, focusing on screening in young females. Using the Boolean phrases search feature, the phrases *ADHD, primary care, assessment children or adolescent or youth or students* produced 2,981 works; further limiting to girl or women in CINHAL revealed 15 articles. Utilizing the exact keywords in PsychINFO yielded 104 peer-reviewed studies already determined to Meta-analysis, systematic reviews, longitudinal studies, and quantitative studies. In PubMed, adding the criteria *females from birth to 19*, the database search yielded 26 studies. At the end of this search 25, high-level studies have been selected for review because of their focus on ADHD assessment in primary care, focusing on girls, and ADHD screening tools' efficacy.

Critical Appraisal and Synthesis of Evidence

Ten high-quality studies have been retained for further review. The years in which the studies were, conducted range from 2016 to 2019. The rapid critical appraisal by Melynk and Fineout-

Overholt (2019) is utilized to evaluate the selected studies' strength and quality. Retained for review are one meta-analysis, two systematic reviews, two RCTs, and five cohort studies. The demographics of the studies are children and adults in the outpatient setting. Participants are diagnosed with ADHD, referred for ADHD symptoms, and those who have not been diagnosed with ADHD. The significant variables of the ten studies are screening for ADHD, ADHD symptom detection, and diagnosis. Two of the studies were conducted in the United States. The remaining studies were conducted internationally in Germany, India, Italy, Norway, Saudi Arabia, Taiwan, and two in the United Kingdom. The interventions were directed towards the efficacy of screening for ADHD symptoms. The ages of participants range from 6-25 years old. All studies utilized a screening tool as an intervention to assess for signs of ADHD, and two studies used the self-report of symptoms.

The data analysis used in the ten studies consists of independent t-test, Chi-square, linear regression, Cohen's d, ANOVA, Post Hoc contrast, and the use of Statistical Package of Social Sciences (SPSS) software, version 23. The studies have some strength, and most of the studies have shown significance in identifying ADHD symptoms and have low attrition rates. The weaknesses of some studies were sample size and population type. One of the studies contained a twin sample, which does not allow for generalizable results to the generable population (see Appendix A).

Theoretical Framework and Evidence Base Practice Model

Rosswurm et al. (1999) created an EBP model in 1999 (see Appendix C); this model guides healthcare professionals through the processes of change in practice. This model is applicable to be used in the primary care setting to establish practice change. Derived from the theoretical literature, this EBP model has six different steps, which includes assessing the need

for change, linking the problem to interventions and outcomes, synthesize the best evidence, design a change in practice, implement and evaluate the practice change and integrate and maintain the difference (Rosswurm et al., 1999). Primary care offices are all different. Workflows must remain fluid to preserve time; therefore, practice strategies should be evaluated before settling on what will stay as a permanent solution. Initiating ADHD screening in the primary care practice will capture many young girls that would typically go undetected and improve the current quality of care in this setting.

The Health Promotion theory (see Appendix D) by Nola Pender focuses on helping people achieve their highest level of well-being, promoting health as a positive dynamic state rather than the absence of disease (Adom et al., 2018). Preventative health measures echo the importance of ADHD screening. As the literature shows, the plethora of poor outcomes associated with ADHD, screening for, and detection of ADHD allows those diagnosed with the opportunity to shape their future. Young individuals diagnosed with a parent's help will focus on self-confidence and self-efficacy in managing their ADHD. This promotion of high self-esteem is crucial in young girls with ADHD.

Implications for Practice Change

As the literature provides the evidence that early intervention in ADHD yields the best outcomes, early detection is necessary to provide the best opportunity for the individual. Young girls are of most importance, as they are the population that is more likely to go unnoticed and untreated. The primary care setting holds one of the best opportunities for the implementation of an ADHD screening tool, providers can pinpoint behaviors unrecognized in the home or school setting. Speaking with stakeholders have supplied the internal evidence that shows the need for assessment of ADHD, as this is an area never touched or thought of until there is a complaint by

parent or school authority. Additionally, the proper screening tool to benefit the patient was chosen. Evidence shows that many ADHD scales used in research and in practice are efficacious in identifying ADHD symptoms. Furthermore, during each well care child visit the ADHD screening will be provided to parents. The screening was not be limited to only girls, but the data extracted was. The goal of screening is to identify children meeting the criteria for ADHD and providing them with the best resources to confirm diagnosis and select the best fitting course of treatment.

Methods

Participants

The Arizona State University Review Board approved this project on October 2, 2020. The project was carried out between October 19, 2020, to December 5, 2020. Thirty-five primary care providers received education on sexes in ADHD. The group consisted of Medical doctors, Nurse practitioners, and Physician Assistants. Inclusion criteria asked participants to be English speaking, provide written consent, and provide primary assessment and treatment for children between the ages of 2-17 years old. Exclusion criteria was providers that do not speak English or treat children under 18 years old. The education was provided via virtual format. Five providers all-female filled out both pre- and post-surveys.

Study Design

This evidence-based project's design was a mixed-method design with face validity pre- and post-surveys. There was no funding received for this project. Participants with the potential to partake in the project were emailed a flyer about the project. If they were interested, they were called and emailed a consent form. The phone call provided the participants the opportunity to ask any concerning questions and review the consent. Two live education sessions were held via

virtual format, and participants could choose the date they were able to attend. Before the education, participants received an email with a link to the pre-survey.

Data Collection

The education was presented via PowerPoint and lasted about 20 minutes. It provided the most recent evidence about sex differences in ADHD. Four weeks post the education intervention, participants received their post-surveys. The survey assessed for awareness of sex difference in ADHD and current use of ADHD screening in practice. Participants were able to comments about the sex differences in ADHD education at the end of each survey. The surveys were provided by Question Pro, which provided access only to the person who creates the survey for added safety.

Data Analysis

Participants were deidentified by providing their unique identifiers so surveys would remain anonymous while completing the data analysis. Two surveys were administered before and four weeks after the educational sessions. Five providers were able to complete the surveys. Using a thematic analysis method, provider comments were analyzed for commonality. Given the limited number of participants, the themes are identified quickly. A two-tailed paired samples *t*-test was conducted to examine whether the mean difference of Pre ADHD screen month and Post ADHD screen month was significantly different from zero.

Results

By self-report, providers reported sex differences in ADHD, but pre-intervention surveys show low ADHD screening rates before intervention. A few themes emerged from the comments of the surveys. Providers admitted that identification of ADHD symptoms comes from the parents mostly due to school identification. The providers also commented that regular screening

would help identify girls, but appointment time constraints are a barrier. Pre – Post-test results revealed that there was a change in ADHD screening four weeks post-intervention. The result of the two-tailed paired samples *t*-test is significantly based on an alpha value of 0.05, $t(4) = -6.32$, $p = .003$, indicating an increase in ADHD screening.

Table 1

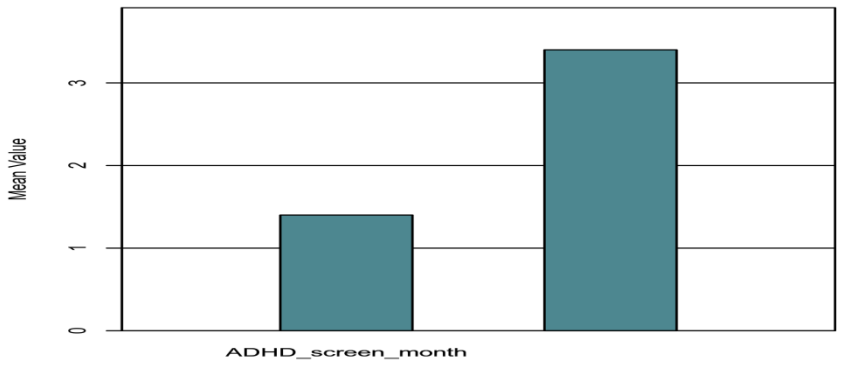
Two-Tailed Paired Samples t-Test for the Difference Between Monthly ADHD screenings pre-intervention and post-intervention

ADHD screening/month pre-intervention		ADHD screening/month post-intervention				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
1.40	0.89	3.40	1.14	-6.32	.003	2.83

Note. N = 5. Degrees of Freedom for the *t*-statistic = 4. *d* represents Cohen's *d.*

Figure 1

The means of pre-ADHD screening and Post ADHD screening



Pre-Intervention Screenings Post-Intervention Screenings

Sustainability

New acquired knowledge is the steppingstone to change (Brown, 2012). Once evidence-based education is provided, it sets the stage to translate to practice. A brief education provided awareness of sex differences in ADHD and perhaps prompted providers to increase their screening rates. Primary care providers within this practice have the resources to carry out regular ADHD screening but are concerned with time constraints. Addressing the time constraints will assist in the constancy of screening and promote sustainability. Exploring new workflows for providers may help support the screening process.

Discussion

The thematic analysis yielded a few common themes among providers. The concern of appointment time constraints was the most consistent concern among participants of this project. They also agreed that consistent screening in practice would identify girls with ADHD earlier. The brief education increased awareness which increased screening in practice. This study's qualitative focus highlights that participants are not usually involved in ADHD symptom recognition. These findings also overlap with previous studies where providers report that they follow the parents' recognition of ADHD symptoms (French et al., 2020). The complaint of appointment time restraints is also another theme noted in the research. Each primary care setting is unique, and resources vary; therefore, providers must find what workflows are compatible for them and their teams to accommodate ADHD screening and related services (French et al., 2018). Limitations of the study consisted of poor sample size and not being able to identify if ADHD screenings increased in girls.

Implications

We now know that ADHD is a lifelong disorder, and it should be diagnosed early, and

intervention should happen quickly. Identifying ADHD in young girls using a simple screening tool is a significant health promotion intervention. The screening will identify the need for further assessment, therefore leading to providers' opportunity to educate parents. From early detection, there is also an opportunity to avoid the self-shaming, anxiety, and depression in women diagnosed with ADHD as an adult. According to the HPM, people are highly motivated to achieve excellence and maintain stability; therefore, early detection and intervention of ADHD will set the foundation for positive future outcomes by offering the girls the opportunity to succeed without stress (Adom et al., 2018).

Conclusion

The very public information about ADHD favoring boys more than girls points to a bias in the literature; therefore, the research must continue to explore sex differences in ADHD. Current literature on ADHD supports the understanding that there is a difference between genders when detecting ADHD symptoms. Young girls are naturally at risk, given the dominance of their inattentive symptom presentation. Screening young girls for ADHD is imperative because the long-term outcomes that can occur may affect their self-esteem, academics, future job status, partner choice, and overall mental health. In undetected ADHD, the cost could be more expensive than the treatment. Most importantly, the longer young girls go untreated there is a chance of continuous lifelong misdiagnosis.

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Appendix A

Table 1

Quantitative Evaluation Table

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Amer et al., (2019). Appraisal of clinical practice guidelines for the management of attention deficit hyperactivity disorder (ADHD) using the AGREE II Instrument: A systematic review Country: Saudi Arabia Funding: Saudi ADHD Society Bias: none	Health Promotion Model	Systematic Review Purpose: The primary objective of this study is to provide a comprehensive, easily accessible, and updated assessment of the quality of available CPGs pertaining to ADHD	N = 6 CPGs included were published between 2012 and 2019, DS= Medline/PubMed Google Scholar, EBSCO DynaMed Plus CPG databases: (AHRQ) National Guideline Clearinghouse (US),	IV= AGREE II instrument DV= CPG yielding the highest assessment	AGREE II instrument	The quality of each included CPG was appraised by three independent appraisers using the Appraisal of Guidelines for Research & Evaluation II (AGREE II) instrument.	DV= The AGREE II standardized domain scores for overall assessment ranged from 50% to 100%. All CPGs scored greater than 60% in the first overall assessment, except AAP, NHMRC and SMOH.	LOE=I Strengths: one CPG rated to be the best guidelines for ADHD, conducted by a multidisciplinary team Weaknesses: The AGREE II, does not comprehensively appraise certain items of the CPG,

Key: Area under the curve –**AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment –**DAWBA**; Exploratory Structural Equation Modeling – **ESEM**; HI= Hyperactivity- **HI**; Level of Evidence – **LOE**; Likelihood Ratio –**LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire –**SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

		diagnosis and management, using the gold standard instrument, AGREE II	Health and Care Excellence (NICE; UK), Inclusion: English CPGs from 2012-2019. Exclusion: CPGs that were published earlier than 2012, written in non-English language				Overall the NICE CPG received the highest scores on all six AGREE II domains, in addition to the highest score in the first overall assessment; it was the only CPG that received a score of 100%.	exclusion of non English Conclusion: The NICE CPG shows useful in practice with a rating of 100% Feasibility: implication for practice is to encourage healthcare providers caring for patients with ADHD to adopt principles of 'Evidence-Based' rather than 'Eminence-Based' Healthcare in their daily practice through training and

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								education on CPG standards and appraisal tools
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Chang et al., (2016). Level/Quality of Evidence; Decision for practice/ application to practice. **Country:** Taiwan **Funding:** Department of Nursing, Cardinal Tien Junior College of Healthcare and Management, New Taipei City, **Bias:** none	Health Promotion Model	Systematic Review Meta-analysis Purpose: To evaluate and compare the diagnostic performance of CBCL-AP and CRS-R in diagnosing ADHD in children and adolescents.	**N**= 11 **DS**: PubMED, OVID Medline, Embase, Cumulative Index to Nursing and Allied Health Literature, PsycINFO, and Web of Science. Inclusion: studies evaluating the diagnostic performance of either CBCL-AP	IV1= provide pooled estimates of the diagnostic accuracy of CBCL-AP and CRS-R DV1=Pooled sensitivities of assessments CBCL-AP and CRS-R DV2= compare the diagnostic	Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool. Two reviewers used this tool to conduct a quality assessment.	Review Manager 5.2, Stata Version 13 (metandi and midas commands), and SAS Version 9.3. Bivariate random effects model Likelihood ratios (LRs), and DORs. Feasibility: Bothe	DV1=results revealed pooled sensitivities of 0.77, 0.75, 0.72, and 0.83 and pooled specificities of 0.73, 0.75, 0.84, and 0.84 for CBCL-AP, Conners Parent Rating Scale–Revised, Conners Teacher	LOE= I Strengths: the overall ability of each tool to accurately classify participants as cases or noncases was moderate to high, also the first of its kind. Weaknesses: The American Academy of Pediatrics Guidelines Diagnostic

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			scale or CRS-R for diagnosing ADHD in pediatric populations in comparison with a defined reference standard. Exclusion: Studies were excluded if they failed to meet the inclusion criteria	performance of CBCL-AP and CRS-R		assessment tools are commonly used diagnostic tools for identifying ADHD in children	Rating Scale–Revised, and Conners Abbreviated Symptom Questionnaire (ASQ), Respectively. DV2= CBCL-AP and CRS-R have comparable diagnostic performance in sensitivity, specificity, and DORs.	does not approve using a broadband assessment tool like the CBCL for diagnosing ADHD. heterogeneity in CBCL-AP, went unexplained. Conclusion: the meta-analysis revealed that CBCL-AP and CRS-R demonstrated moderate sensitivity and specificity established reliability and validity.
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/

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								application to practice
Hall et al., (2019). The Validity of the Strengths and Difficulties Questionnaire (SDQ) for children with ADHD Symptoms. Country: England Funding: By the National Institute of Health Research (NIHR) Bias: None	Health Promotion Model	Randomized Controlled Trial (RCT) Purpose: to Understand the factor structure of the SDQ in clinic referred ADHD sample, and validate the scale as a screening/ diagnostic aide and as a measure of treatment outcome both in clinical and research.	N=250 Children from Community Pediatric clinics CG= 127 QbTest withheld for 6 months IG= 123 Participants received QbTest results rapidly received Inclusion: children ages (6-17) referred for initial ADHD assessment to Community Health Clinic Exclusion: Previous or current ADHD diagnosis or assessment, non-fluent English, moderate or	IV: SDQ is a brief 25 item, measures of be behavioral and emotional difficulties that cab be used to asses for mental health disorders in children ages. DV1: SDQ factor structure. DV2: Association between SDQ algorithm and ADHD diagnosis. DV3: The Longitudinal measurement invariance between	SDQ is a brief 25 item, measures of be behavioral and emotional difficulties that cab be used to asses for mental health disorders in children ages (4-17). DAWBA= Questionnaires and rating techniques, to generate ICD-10 and DSM-IV/ DSM5 psychiatric diagnosis for ages (5-17). Consultation pro forma, clinicians were required to document whether a confirmed diagnosis of ADHD is	Exploratory structural Equation modeling (ESEM) used to investigate the factor structure of the SDQ between treatment groups, informants and time points. Ordinal item score was analyzed with the WLSMV. Testing the criteria-related validity of the SDQ, isolated logistic regressions using STATA 14 were conducted to	DV1: SDQ factor structure: Significant correlations between factors are present in For parent data, weak negative correlations were found between the pro-social factor and peer and conduct factor, a stronger negative correlation between the conduct and pro-social factor was also found with teacher	LOE =II Strengths: SDQ is internationally a widely used, novel and vigorous techniques used, 5-factor revealed as the best fit for parent and teacher data, SDQ was associated with research and clinical diagnosis of a referred sample, noninvasive, RCT. Weakness: weak correlations between, internalizing factors and

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			severe intellectual delay. Exclusion: Previous or current ADHD diagnosis or assessment, Moderate or severe intellectual disability, non-fluency in English.	parent and teacher. DV4: Measurement invariance test of a 5-factor structure across time points: DV5: Longitudinal measurement invariance between the two treatment groups across time points for parent and teacher data	confirmed	investigate whether the SDQ can predict ADHD/hyperkinetic diagnosis made by independent research criteria for ADHD based on the DAWBA-derived diagnosis (DSM-IV/V), independent research criteria for HKD based on the DAWBA-derived diagnosis ICD-10, and clinician rated diagnosis of ADHD. To evaluate the ESEM model fit, Comparative	data (.427). The strongest correlation was found between hyperactivity and emotion for parent data at the follow-up time point (.510). DV2: Association between SDQ algorithm and ADHD diagnosis: The SDQ algorithm predicted that a hyperactivity disorder was probable in 35% (79/228), possible in	peer problem and emotional problems, mixed results in the ability to predict ADHD, did not collect self report, missing data, Conclusion: results of an ESEM approach showed that a 5-factor structure best fitted parent and teacher rated SDQs for a sample of children and young people referred to specialist services for an ADHD assessment. The 5-factor structure showed strong

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						Fit Index (CFI), non-normed fit index (NNFI) and Root Mean Square Error of Approximation (RMSEA) along with χ2 test were examined. The Mplus DIFFTEST function were used to conduct χ2 difference tests between the two nested models.	59% (135/228) and unlikely in 6% (14/228) of the sample. DV3: The Longitudinal measuremen t invariance between parent and teacher data compared across time points: show strong factorial invariance for the 5-factor structure. DV4: Measuremen t invariance test of a 5-factor structure across time	factorial measurement invariance across treatment groups and time points. Feasibility: the factor structure of the SDQ should be considered a valid and robust outcome measure for future research studies and to inform clinical judgment of patient symptoms/ improvement.

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							points: The threshold invariance model results showed that the 5-factor structure model evidenced a strong factorial invariance across measuremen t time points (baseline and follow-up). DV5: Longitudinal measuremen t invariance between the two treatment groups across time points for parent and teacher data:	

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							the results showed strong factorial invariance, indicating the 5-factor structure model with similar loading patterns remained stable between baseline and follow-up for parent data, with a small amount of item threshold estimates freely estimated between baseline and follow-up time	
Citation	Theory/	Design/	Sample/ Setting	Major	Measurement/	Data Analysis	Findings/	Level/Quality

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	Conceptual Framework	Method		Variables & Definitions	Instrumentation		Results	of Evidence; Decision for practice/ application to practice
Leopold et al., (2018). Invariance of ADHD Symptoms Across Sex and Age: a Latent Analysis of ADHD and Impairment Ratings from Early Childhood into Adolescence Country: United States Funding: The department of Psychology , University of Colorado Bias: None	Health Promotion Model	Longitudinal Twin Study Purpose: The purpose of this study was to investigate the properties of IN and HI and associated life outcomes over a 10 year period in children with ADHD	N= 978 n= 224 Monozygotic n= 265 Dizygotic Same sex twin pairs N= 482 pairs Mean age: 4.9 Patient Type: participants were part of the Colorado component of the International Longitudinal Twin Study of Early Reading Development Retention: Excellent at	IV= Factor structures IN and HI DV1=Trajecto ry (ADHD stable across Development) DV2= Male/ female develop-mental course DV3= IN and HI associated with poor life outcomes.	Disruptive Behavior Rating Scale was used to obtain parent ratings of the 18 symptoms of DSM-IV ADHD.	SEM was used to address 3 questions about development trajectory, risk associated with ADHD and Measure-ment properties. Cronbach's alphas for the IN and HI dimensions ranged from 0.89 to 0.93 and 0.86 to 0.88, Confirmatory factor analyses Mplus statistical	DV1= HI symptoms declined, with medium to large effect size paired t-test (d= 0.4–1.0). IN and Functional impairment remained stable (d (d < 0.2 for all changes between years). DV2: Mean ratings of IN, HI, and overall impair ment were all higher for	LOE= II Strengths: Longitudinal study with excellent retention rate, Using the highly reliable tool for ADHD assessment, large sample, children tested 6 times, with repeated results and Sex similarities are equivalent with previous studies. Weaknesses: Same sex twins pairs used, limit to

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			92% from preschool to 9th grade.			software package (Version 7.4; used for structural and measurement analysis. WLSMV= for item level analysis. Paired t-test: for differences between ratings, From Preschool to 9th grade.	males than female (mean d for IN, HI, and impairment = 0.32, 0.35., and 0.27, respectively) D3= both IN and HI were independentl y associated with overall impairment, social impairment, and recreational impairment at all six assessments.	generalization, and all rating completed by parents. Conclusion: Additional studies are needed to delineate differences of ADHD be sexes, and early onset of IN and HI are associated with increase risk social and recreational impairment. Feasibility: This study is feasible to practice as it duplicates evidence noted in previous studies.

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Millenet et al., (2018). Sex.specific trajectories of ADHD symptoms from adolescence to young adulthood. Country: Germany Funding: Department of Child and Adolescent Psychiatry and Psychotherapy, Central Institute of Mental Health, Medical Faculty Mannheim/Heidelberg University, Mannheim, Germany Bias: Dr. Banaschewski served in an advisory or con	Health Promotion Model	Longitudinal Cohort Study Purpose: of the study is to clarify the sex-specific development of differences in self-reported symptoms in young adult participants with and without diagnoses of childhood ADHD	N = 336 n = 161 Males n = 175 Female Data used evaluations carried out at ages 4.5, 8, 11, 15, 19, 22, 23, and 25 Patient Type: participants of the Mannheim Study of Children at Risk, an epidemiological cohort study Inclusion: Born from 1986-1988, firstborn	IV1: sex IV2: Childhood ADHD diagnosis DV1= the effects of childhood ADHD diagnosis on parent reports of adolescent ADHD DV2 = the congruence between parent ratings and self-	MEI= used to monitor parent ratings from ages 4.5 to 11. The MEI is a standardized, interview used to assess major DSM IV diagnoses. Achenbach DSM.oriented ADHD Scale= used to compare ADHD rating over a long period of time. Child Behavior Checklist	Chi squared tests ANOVA polynomial regression model Post hoc contrasts	DV1= Significantly more male than female participants received a diagnosis of childhood ADHD n = 32 males, male to female ratio 2.1:1). DV2: congruence between self- and parent ratings at age 15 years	LOE = II Strengths: large sample size, longitudinal study, epidemiological cohort study and low attrition rate. Weakness: Parent rating only available up to age 15, ADHD symptoms vary therefore the YASR should reflect symptom changes that's

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sultancy role for Actelion, Hexal Pharma, Lilly, Lundbeck, Medice, Novartis, and Shire. He received conference support or speaker's fees from Lilly, Medice, Novartis, and Shire. He has been involved in clini cal trials conducted by Shire and Viforpharma. He received royalties from Hogrefe, Kohlhammer, CIP Medien, and Oxford University Press. The present work is unrelated to the above grants and relation ships.			to German speaking parents. Exclusion: children with severe physical handicaps, known severe genetic defects, or metabolic diseases. Attrition 48 participants dropped out before 25 years old.	ratings. DV3: trajectories of self-reported ADHD symptoms from adolescence to young adulthood.	Youth Self-Report These questionnaires are used to assess problems in individuals ages 4-18 and 11-18.		revealed a significant interaction of sex by childhood ADHD diagnosis by parent rating ($F(1,320) = 7.77$, $p = 0.006$). DV3= significant interactions of sex by childhood ADHD diagnosis on intercept ($F(1,609) = 11.13$, $p = 0.001$), slope ($F(1,609) = 4.28$, $p = 0.039$) and curvature ($F(1,609) =$	occur with older age. Conclusion: Further research is needed to which informant provides a more accurate report of ADHD. Sex leads to differences in reports of ADHD symptoms Feasibility: this study is feasible to practice as it can be recognized that sex should be consider in the assessment and diagnosing of ADHD.

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							4.19, p= 0.041) of trajectories of self-rated ADHD symptoms. Thus, sex significantly moderated the effect of childhood ADHD diagnosis on the baseline level at age 15 years and on the course of self-reported ADHD symptoms up until the age of 25 years.	
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice

Key: Area under the curve –**AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment –**DAWBA**; Exploratory Structural Equation Modeling – **ESEM**; HI= Hyperactivity- **HI**; Level of Evidence – **LOE**; Likelihood Ratio –**LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire –**SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

Molina et al., (2018). Substance use through adolescence into early adulthood after childhood –diagnosed ADHD: findings from MTA longitudinal study. Country: United States and Canada Funding: NIMH and NIDA Bias: no conflicts of interest	Health Promotion Model	MTA Longitudinal study RCT,with 14 month treatment phase, assessed at ages 2-16. Purpose: To further investigate/ clarify the risk in which early childhood ADHD has on the development of SU in early adulthood and Adulthood.	N= 805 n =547 ADHD n = 258 LNCG Mean age: 8.5 Patient Type: early childhood ADHD, and participants without ADHD Setting: patients came from schools, primary care, mental health clinics and family-base referrals. ADHD participants were randomized. LNCG were assessed on the same schedule as the ADHD group. Inclusion: diagnosis of ADHD in childhood Attrition:	IV: Self report Substance Use Questionnaire (SUQ), self report which allows one to report recent and past SU. DV1: Early SU in ADHD group D2 = SU in adulthood	Self report Substance Use Questionnaire (SUQ)	Chi-Square Test: compared percentages of ADHD to LNCG Generalized multilevel linear modeling with PROC GLIMIX procedure in SAS: to test the use of ADHD versus LNCG differences in SU escalation. adulthood	D1= Early SU in ADHD group (317/547,59 % than LNCG 108/258 41.8%, $\chi 2$ 1)=23.67, $p <$ .0001. D2 = SU in adulthood 33% of adults with childhood ADHD, LNCG 21% particularly for cigarette smoking 36% of ADHD versus 18% LNCG.	LOE: I Strengths: randomized control trial, low risk, noninvasive, low attrition rate, and findings consistent with similar studies, large sample size, multisite design and prospective assessments. Weaknesses: random assignment did not predict SU or escalation Conclusion: more research is need to identify interventions that will prevent

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			Withdrew early: n=41MTA, n=12 LNCG					children with ADHD from SU trajectories. Feasibility: SUQ feasible in practice, low cost and able to identify early substance use behaviors.
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Mowlem et al., (2019). Do different factors influence whether girls versus boys meet ADHD diagnostic criteria? Sex differences among children with high ADHD symptoms.	Health Promotion Model	Population Based Study Purpose: To investigate if different factors influence whether girls versus boys meet diagnostic	N = 392 n= 276 boys n=116 girls Mean age 9.42 years Participants: Were part of a sub study PHAD. Parents completed the PACS ADHD	IV = the Parental Account of Childhood Symptoms (PACS) tool. DV1= Sex dependent bias DV2= Parent	Parental Account of Childhood Symptoms (PACS) was used to identify children who met diagnostic criteria for ADHD. PACS is an investigator-rated semi-structured	Linear regression models for continuous outcomes and logistic regression for binary outcomes. Cohen's d for continuous	DV1= bias was reflected in the total score, and analyses found a significant sex-by-scale interaction for hyper activity/	LOE= II Strengths: sex dependent bias noted among parent reports. Incorporation of diagnostic interview as well as use of objective, investigator-rated interview.

Key: Area under the curve –**AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment –**DAWBA**; Exploratory Structural Equation Modeling – **ESEM**; HI= Hyperactivity- **HI**; Level of Evidence – **LOE**; Likelihood Ratio –**LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire –**SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

Country: UK Funding: the UK Medical Research Council Bias: none		criteria for attention deficit/ hyperactivity disorder(ADHD) among children with high ADHD symptoms.	diagnostic interview at the family home when the children Exclusion criteria were: autism spectrum disorder, learning disability, and neurological disability	report compared to PACS	interview developed as a standardized measure for use in assessing and recording accurately the behaviors of children. SDQ = a tool behavioral and emotional problems	variables	impulsivity (p<.02, 95%CI: -2.48 - -0.32) indicating that parents tend to under-rate girls and over-rate boys for the presence of Hyperactive &impulsive symptoms compared to PACS. DV2= In both boys and girls meeting diagnostic criteria, frequencies of inattentive symptoms were greater in the parent-rated scale compared	Weakness: mismatch in the numbers boys/girls, no statistical significance noted, the study carried out in a twin sample. Conclusion: Emotional symptoms are prominent in the female presentation of ADHD. Its is important that emotional problems does not rule out ADHD in girls. Also prosocial behavior may have a diagnostic factor in favor of girls with ADHD. Feasibility: The PACS can be

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							to the PACS interview, apart from 'attention to details' (12.5% lower in the parent-rated scale in girls and 7.5% in boys), 'organizing tasks' (28.1% lower in girls and 22.3% in boys), 'loses things' in girls only '(3.1% lower), and 'listening' and forgetful' in boys only (0.8% and 2.5% lower respectively)	applied to practice to assess for girls with ADHD that meet some checklist criteria noted in the DSM5.
Citation	Theory/	Design/	Sample/ Setting	Major	Measurement/	Data Analysis	Findings/	Level/Quality of

Key: Area under the curve –**AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment –**DAWBA**; Exploratory Structural Equation Modeling – **ESEM**; HI= Hyperactivity- **HI**; Level of Evidence – **LOE**; Likelihood Ratio –**LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire –**SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

	Conceptual Framework	Method		Variables & Definitions	Instrumentation		Results	Evidence; Decision for practice/ application to practice
Overgaard et al., (2018). Attention-Deficit/Hyperactivity Disorder in Preschoolers: The Accuracy of a Short Screener Country: Norway Funding: Norwegian Institute of Public Health Bias: none	Health Promotion Model	Cohort Study to determine the accuracy of the SDQ HI subscale in preschoolers by comparing parent and teacher reports.	N=514 n=238 girls n=276 boys (mean age 3.5 years) Pt. Type: Preschoolers Setting: preschoolers in home and School setting. Inclusion: preschoolers with 90 or above on the MoBa Questionnaire (n=417) above 90 percentile (n=97) were randomly selected from MoBa.	IV: SDQ HI, is a brief 25 item, measures of be behavioral and emotional difficulties that cab be used to asses for mental health disorders in children ages, with a 5 question hyperactivity –inhibition subscale that rates HI behaviors. DV1: Parent ratings	Preschool age Psychiatric Assessment interview (PAPA) with caregiver. SDQ Norwegian version for age 4-16 years. Chronbach's x values on the HI subscale were 0.79 for parents and 0.86 for teachers	SPSS, version 23, and software R3.2.2 software. Chronbach's x measured differences between means of continuous variables measured by *t* tests. ROC analysis used to measure AUCs to qualify accuracy of the SDQ HI subscales. PPV and NPV	D1= parent rating outperformed D2 Ratings significantly (girls =3.22, *p* =.001; boys: D = 4.04, *p* <.001).	LOE = II Strengths: Population based cohort design, use of the SDQ, parent diagnostic interview, proven Hypothesis Parent SDQ HI girls inattention is an accurate screener of ADHD, useful to detect hyperactive girls, noninvasive, Weakness: selection bias, sub study, over sampling, outcome based

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				DV2: Teacher ratings				on parent report. Conclusion: SDQ HI discriminated well for preschools with and without ADHD. Feasibility: used in practice already, recommendation to prioritize parent SDQ over teacher SDQ.
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Pinzone et al., (2019). Temperament correlates in adult ADHD: A systematic review.	Health Promotion Model	Systematic Review of Literature Purpose: was to collect studies that	N= 15 papers DS= Pubmed and PsychInfo were searched using the following	IV1= Personalize ADHD treatment IV2= Education on	Measurement tools that were inclusive of the studies examined during the systematic review TCI	Studies were reviewed by two independent reviewers using the PRISMA	DV1= temperament traits do not seem to show sufficient	LOE = I Strengths: the reviewed shows that tempera-ment has correlation to ADHD.

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Country: Italy Funding: Department of Neuroscience and Mental Health in Italy Bias: none		investigated temperament correlates in adult people with ADHD, to well understand the connection between them and the eventual role of temperament as a therapeutic marker.	key words: ("attention deficit hyperactivity disorder" OR "adhd") AND (“temperament ” OR “temperament evaluation”). Inclusion : studies that measured temperament traits in ADHD adults using the Temperament Evaluation of Memphis, Paris and San Diego-Auto questionnaire (TEMPS-A) or the Temperament and Character Inventory (TCI). Exclusion: papers written	temperament DV1= Provide state-of the art evidence on temperament using TCI and TEMPS Scale DV2=ADHD in adults	TEMPS-A	statement Bibliographies of the retrieved papers were searched by hand for additional publications.	specificity to serve as a tool for differentially diagnosing ADHD. DV2 = No study used both scales so scales were assessed separately for ADHD indications. TCI studies shows consistency with one another, that Novelty Seeking and Harm Avoidance temperaments are consistent with a dx: of ADHD. TEMPS-A	Weakness: Unable to find studies that use bot TCI and TEMPS-A, and sample types differed. Conclusion: The papers in this review show consistent results in indicating that ADHD is associated with specific temperament traits whose severity may be a potential indicator affirming additional treatments for emotional dysregulation patients.

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			in languages other than English, studies based on temperament evaluation in children and adolescents, and off-topic papers.				Study tested patients for only ADHD Symptoms and ADHD patients have higher scores on the cyclothymic, depressive, anxious and irritable temperament scales	Feasibility: this study is feasible to practice as it shows emotional dysregulation can be an indicator of ADHD or a comorbid ADHD Bipolar diagnosis.
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Singh et al., (2016). To study attention deficit hyperactivity disorder (ADHD) amongst adolescent children referred for behavioral problem.	Health Promotion Model	Cross sectional Study Purpose: to investigate the prevalence of ADHD in age grouped 11-16 years referred to clinic for behavioral	N=148 boys/girls Patient Type: Boys and girls referred by school for behavioral problems or brought in by	IV= DV1= Inattention between male and female DV2= Hyperactivity between	CONNERS MHS Questionnaire Modified Kuppuswami Scale	t- test QI-Macros 2014 Software	DV1= significant difference in the score for inattention between male and female (M=42.14) and female	LOE= III Strengths: the shows behavioral differences between male and female with AFHD, Weakness:

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Country: India Funding: salve Institute of Medical Science Bias: none		problems and I identify genders differences between groups	parents. Inclusion; All Adolescents boy and girls ages 11-16years old. Exclusion: Parents that did not consent, behavioral issues less then 6months.	male and female DV3: Defiance/Aggression between male and female			adolescents (M =46.79) t-score 1.381,significant 0.05. DV2: Hyperactivity male (M =50.34) and female (M =42.49), t Score 2.456, significant at 0.05. DV3= defiance and aggression, male (M =56.35 and female adolescents (M=46.52),t-Score 5.452, Significant at 0.05.	limited sample size, purposive sample method and areas based research. Conclusion: Consistency is important to successful behavioral change ad management. Feasibility: this study is feasible to practice because it shows the behavior differences between male and females with ADHD. Providers are able to highlight these differences during assessment and provide an

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								accurate diagnosis.

Key: Area under the curve –**AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment –**DAWBA**; Exploratory Structural Equation Modeling – **ESEM**; HI= Hyperactivity- **HI**; Level of Evidence – **LOE**; Likelihood Ratio –**LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire –**SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

Appendix B

Table 2

Synthesis Table

Author	Amer et.al.	Chang et al..	Hall et al	Leopold et al.	Millenet et al	Molina et al.	Mowlem et al.	Overgaard et al.,	Pinzone et al.	Singh et al.
Year	2019	2016	2019	2018	2018	2018	2019	2018	2019	2018
Country	Saudi Arabia	Taiwan	England	USA	Germany	USA	UK	Norway	Italy	India
Design/LOE	SR/I	SR/I	RCT/II	LS/II	LS/CH I	LS/RCTII	CH/II	CH/II	SR/I	CS/III
Sample size/# of Studies included	6 studies	11 studies	250 participants	978 participants	336 participants	805 participants	392 participants	514 participants	15 papers	148 participants
			Study Characteristics							
Demographics										
Children			X	X	X	X	X	X		X
Adults									X	
Mean age			12.5	4.9	5.5	8.5	9.2	3.5		11

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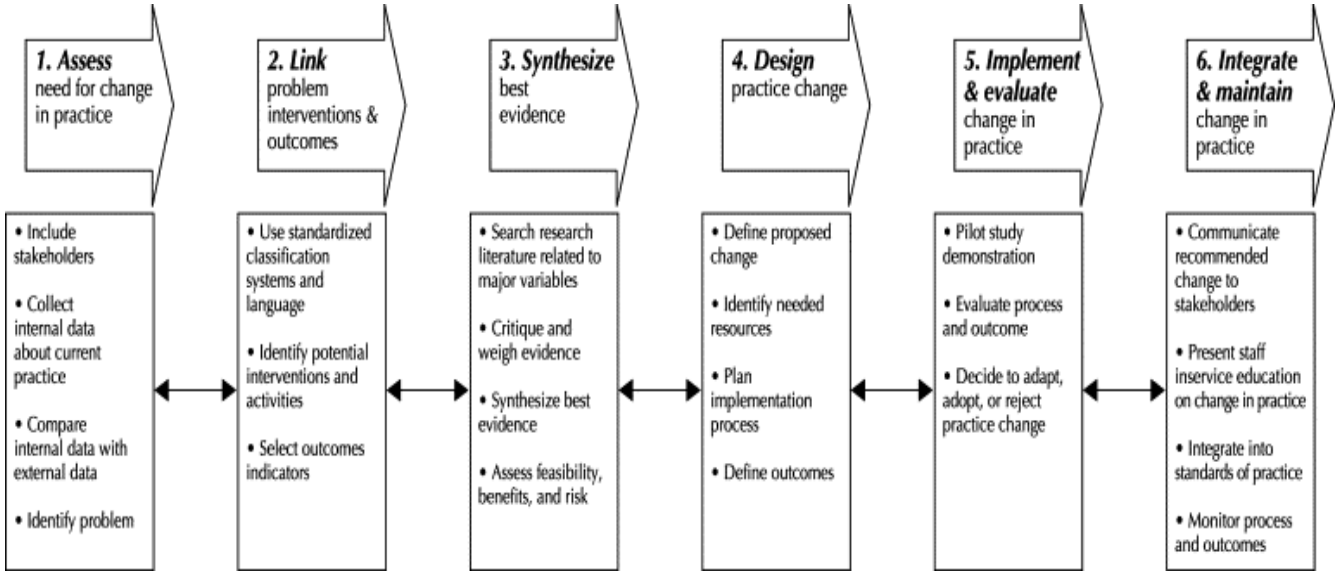
Time Line			2 years	10 years	25 years	16 years	14 months	5 years		
Setting										
Outpatient Primary Care	X	X	X	X	X	X	X	X	X	X
Measurement Tools										
Assessment/Screening tools	AGREE II Instrument	QUADAS	SDQ,DAWBA	MEI, CBCL, YSR	CBCL,YSR	SUQ	PACS,SDQ, PRS	PAPA, SDQ	TCI, TEMPAS	CONNERS MHS Modified Kuppuswa-mi Scale
Outcomes										
Prove diagnostic accuracy of instruments	X	X	X							
Identify symptoms of Hyperactivity/ Impulsivity or aggression	X	X	X	X	X		X	X		X
Assist with ADHD diagnosis	X	X	X	X	X		X	X	X	
Identify drug use in ADHD						X				
Identify Inattentive symptoms in ADHD				X			X	X		
Findings										

Key: Area under the curve **–AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment **–DAWBA**; Exploratory Structural Equation Modeling **– ESEM**; HI= Hyperactivity- **HI**; Level of Evidence **– LOE**; Likelihood Ratio **–LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire **–SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

Significant			X	X	X	X	X	X		X
Non-Significant										

Key: Area under the curve –**AUC**; Attention deficit disorder-**ADHD**; Child behavior checklist- **CBCL;** Conner's Rating Scale revised- **CRS-R;** Comparative Fit Index - **CFI**; Computerized Task measuring attention, impulsivity and activity - **Qb Test**; Development and Well Being Assessment –**DAWBA**; Exploratory Structural Equation Modeling – **ESEM**; HI= Hyperactivity- **HI**; Level of Evidence – **LOE**; Likelihood Ratio –**LR**; Local normative comparison group - **LNCG**; Mannheim Parent Interview =**MEI**; Measurement Equivalence invariance -**ME/I** Multimodal Treatment Study-**MTA**; Negative Predictive Value- **NPV**; Non-normed fit index- **NNFI**; Norwegian Mother and Child -**MoBa**; Parent rated Scale- **PRS**; Positive Predictive values -**PPV**; Preschool Age Psychiatric Assessment ;**PAPA**; Parental Account of Childhood Symptoms PACS; Randomized Control Trial- **RCT**; Receiver operating characteristic-**ROC;** Root Mean Square Error of Approximation -**RMSEA**; Self report Substance Use Questionnaire-**SUQ**; Strengths and difficulties questionnaire –**SDQ**; Structural Equation Modeling= **SEM** ;Substance Use-**SU**; Temperament and Character Inventory = **TCI**; Temperament Evaluation of Memphis, Paris and San Diego questionnaire =**TEMPS-**A; Weighted least squares means and variance adjusted-**WLSMV**

Appendix C



Rosswurm and Larrabee's (1999) evidence-base practice model

Appendix D

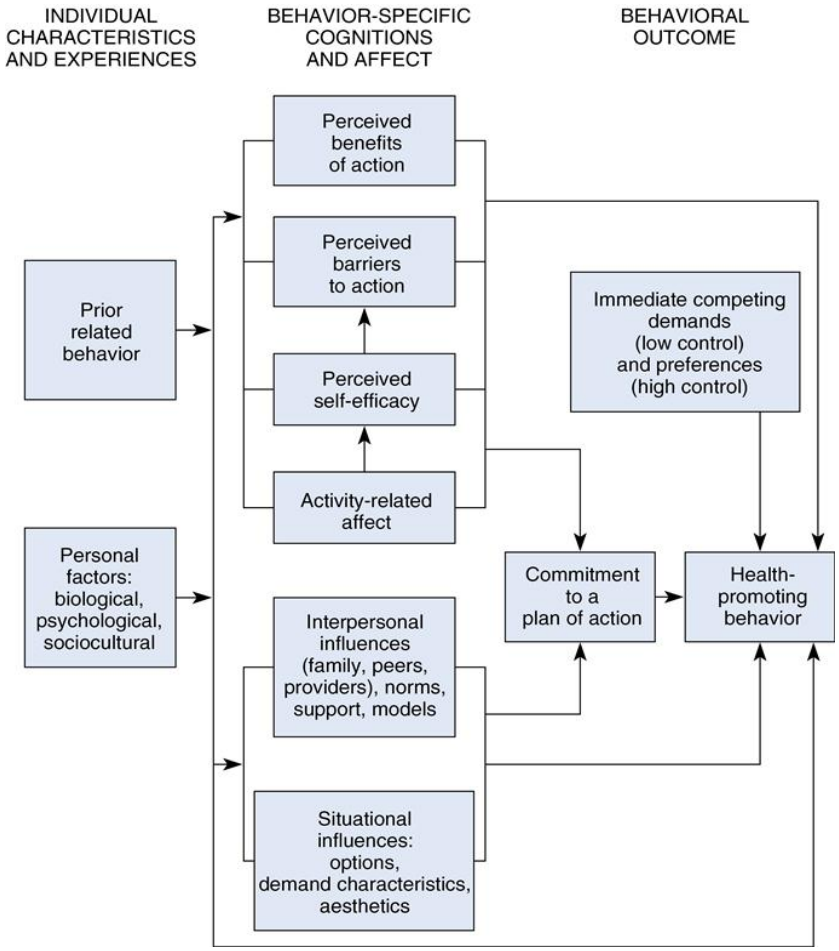


Diagram of Pender's Health Promotion Model (Khoshnood, Rayyani, & Tirgari, 2017).