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SYSTEMATIC REVIEW ON OVEREXCITABILITY AND
ADHD IN GIFTED LEARNERS (1990-2023)

by
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ABSTRACT OF THE THESIS OF

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The proposed study intended to conduct a comprehensive systematic review of the literature of studies between the years 1990 and 2023 in concerning the relationship between overexcitability and Attention-Deficit/Hyperactivity Disorder (ADHD) in gifted learners. Overexcitability, which is characterized by heightened sensitivity and intense emotional experiences, had often been identified in gifted individuals, and ADHD is a neurodevelopmental disorder frequently detected in childhood. Although both milieus have been expanding topics, there had been an inadequate understanding of how overexcitability and ADHD overlap in the gifted population. This systematic review aimed to bridge the identified gap through a synthesis of the existing literature to investigate the links between these co-occurring concepts. This study used a systematic review methodology, integrating rigorous search criteria to collect relevant articles published in peer-reviewed journals between the years 1990 and 2023. Lastly, it aimed to assess the methodological qualities and accuracies of the studies. Six electronic databases, including Education Research Complete, ERIC, Google Scholar, Scopus, PsycINFO and Web of Science were systematically searched employing three sets of keywords to ensure that there was a comprehensive handling of relevant literature. The study also aligned with the PRISMA, Mixed Method Appraisal Tool (MMAT), and the Quality Assessment of Diagnostic Accuracy Studies (QUADS-II) guidelines, where the inclusion and exclusion criteria were applied to choose studies that match the study objectives. The study's significance lied in its ability to inform educators, parents, and other relevant stakeholders about the complexity existing between overexcitability and ADHD in gifted learners. The systematic review uncovered factors and patterns adding to the relation between ADHD and overexcitability in gifted learners, emphasizing diagnostic difficulties and examining the efficiency of targeted interventions. The implications of the systematic review included notifying the advancement of personalized educational interventions and support methods, helping doctors in examining and identifying ADHD in gifted children, encouraging parents to promote their children's needs, and recognizing areas demanding future research. Also, recommendations for future studies were proposed in the last chapter.

Keywords: Gifted, Overexcitability, ADHD, Correlation, Co-occurrence, MMAT, QUADAS-2

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ABBREVIATIONS

ADHD: Attention-Deficit Hyperactivity Disorder

OE: Overexcitability

QUADAS-2: Quality Assessment Tool for Diagnostic Accuracy Studies Version 2

MMAT: Mixed Method Appraisal Tool

CHAPTER 1

INTRODUCTION

The current educational scene is abounding with diversity, where students show a lot of talents, abilities, and challenges. Looking at this diversity of learners, a category that has gained great attention over the years is gifted learners. Gifted learners, characterized by their exceptional cognitive abilities and skills, bring unique characteristics to the educational context. Nonetheless, their educational experiences could be marked by complexities that go beyond their intellectual abilities (Al-Hroub, 2020, 2023, Al-Hroub & Whitebread, 2008, 2019; Bouchet & Falk, 2001). One subcategory of gifted learners employs a phenomenon known as overexcitability, identified with heightened sensitivity, intense emotional experiences, and a tendency for deep engagement with the surrounding world (Lind, 2011). Simultaneously, Attention-Deficit/Hyperactivity Disorder (ADHD), a neurodevelopmental disorder that demonstrates symptoms including inattention, hyperactivity, and impulsivity (Shehab & Al-Hroub, 2019; Wilens & Spencer, 2010) is often diagnosed in childhood, impacting a great portion of the population (Wolraich et al., 2019).

The overlap of the two phenomena, overexcitability, and ADHD, within the gifted learner population has been a matter of interest and investigation for a long time. Although the characteristics of overexcitability and ADHD might seem different, there is an expanding recognition that they might not be completely distinct constructs, specifically within the context of giftedness (Gomez et al., 2020). Although both phenomena are topics of active research, there still exists a gap in the understanding of how the co-occurring concepts interact and manifest within gifted learners. In addition, Al-Hroub and Krayem (2020) assert that the overlap between the two constructs in the

Arab world demonstrates a complex difficulty in the educational context. In Arab countries, gifted learners display ADHD alongside overexcitability among children in the region. Yet, differentiating between these two phenomena is complex due to their similarities in behavioral indicators and the absence of knowledge when it comes to overexcitability. This lack of comprehending overexcitability may cause misdiagnoses and misinterpretations of gifted behavior as ADHD symptoms. Thus, this gap demands a systematic exploration of the relationship between overexcitability and ADHD in gifted learners, which is the focus of the proposed study.

Research Aims and Questions

The primary aim of this study was to thoroughly assess and synthesize existing research on overexcitability and ADHD in gifted learners, common characteristics and the diagnostic tools used. By synthesizing existing research, this study aimed to explore the ADHD, OEs, and giftedness constructs and diagnostic tools that were employed to identify such constructs, the overlap between ADHD and OE in gifted learners, and the methodological quality and accuracy of the available studies on ADHD, OEs in gifted learners between 1990 and 2023 according to Mixed Method Appraisal Tool (MMAT) and Quality Assessment Tool for Diagnostic Accuracy Studies Version 2 (QUADAS-2) guidelines. The four research questions guiding this systematic review were:

1. What are the available studies that explore the constructs of overexcitability (OE) and attention-deficit hyperactivity disorder (ADHD) in gifted learners?
2. What do we know about the diagnostic tools that were employed to identify ADHD and/or OEs in Gifted learners?

3. What is the empirical evidence present concerning the relationship and common characteristics between overexcitability and ADHD in gifted learners?
4. What are the methodological qualities of the available quantitative and qualitative studies as appraised by the Mixed Method Appraisal Tool (MMAT) guidelines, and the Quality Assessment of Diagnostic Accuracy-II (QUADAS-2) guidelines?

Rationale

The intersection of the characteristics related to ADHD and OEs, which is not well-known among educators, clinicians, and practitioners, between gifted learners has caused a controversial conflict within the academic setting (Al-Hroub & Krayem, 2019). Teachers, educators, and practitioners frequently experience difficulties in precisely differentiating the characteristics of these phenomena. This conflict is due to the overlapping traits displayed by individuals with ADHD and those with OEs, which can lead to misconceptions (Al-Hroub & Krayem, 2018). Hence, these professionals might struggle to offer designed interventions, unintentionally intensifying the emotional and academic difficulties faced by gifted individuals.

In tackling this issue, the systematic review is an ideal research methodology for investigating its complexities. Through the utilization of a systematic approach, the present study aims to thoroughly examine various collections of scholarly works, consequently limiting the complex overlap between ADHD and OEs in gifted individuals. Through collecting data from various sources, the present systematic review provides a structured and solid framework for extracting perceptions from different sources, eventually offering an inclusive comprehension of the aforementioned phenomena.

Moreover, selecting QUADAS-2 and MMAT as analytical tools serves a double purpose in tackling the systematic review research questions (Harrison & Rodríguez, 2021). These guidelines provide different and complementary viewpoints on the methodological accuracy and quality evaluation of diagnostic precision. Also, through utilizing both tools, the review aims to offer a solid assessment of the empirical evidence relating to the relationship between ADHD and OEs in the gifted education field.

Significance

The significance of this study extends beyond the theoretical realm to practical applications, with far-reaching implications for the well-being and academic progress of gifted learners contending with the complexities of ADHD and OE.

It holds significant implications for the research landscape within the fields of gifted education, psychology, and neurodevelopmental disorders. It not only seeks to fill a critical gap in the existing body of knowledge by delving into the intricate relationship between OE and ADHD but also advances the empirical understanding of this complex interplay. By filling this void, it promotes a comprehensive understanding of the evidence-based practices produced to enhance the well-being and academic success of gifted individuals, hence, benefiting gifted learners and societies as a whole.

This empirical synthesis is positioned to serve as a base for future investigations in the field of gifted education, fostering a research agenda that addresses the unique challenges of gifted learners with ADHD and OE. By synthesizing and examining available literature on the relationship between OE and ADHD among gifted learners, the present review integrates and extracts different perceptions, findings, and methods on which future research is going to be built.

In addition, the practical implications of this study are profound, extending to educators, parents, and various stakeholders in the field of gifted education. By shedding light on the intricate relationship between OE and ADHD, this study equips educators with invaluable insights into the challenges faced by their gifted students. Hence, the current review is essential for assisting clinicians and scholars in differentiating between OE and ADHD while assessing their gifted learners who might display the symptoms of the aforementioned phenomena.

Armed with this knowledge, teachers can tailor their instructional strategies to better cater to the unique needs of these students, ultimately improving their educational experiences and academic outcomes.

Furthermore, parents of gifted learners often grapple with the challenges of understanding and advocating for their children's complex needs. This study provides parents with a comprehensive overview of the co-occurrence of OE and ADHD in gifted children, enabling them to collaborate effectively with educators to ensure that appropriate support and interventions are in place. These informed partnerships can lead to improved outcomes and enhanced well-being for their gifted children.

CHAPTER 2

REVIEW OF LITERATURE

In this chapter, the existing body of literature pertaining to the relationship between overexcitability and Attention-Deficit/Hyperactivity Disorder (ADHD) in gifted learners were explored. This literature review provides a comprehensive understanding of the current state of knowledge in this area and lay the groundwork for the systematic review to be conducted in this study. This chapter includes systematic review types, a comparison between a literature review and a systematic review, the theory of positive disintegration, perceptions of overexcitability and ADHD, the overlap between these two constructs, the Mixed Method Appraisal Tool, and the Quality Assessment of Diagnostic Accuracy Studies.

Systematic Review Types

Systematic reviews are research strategies utilized to summarize and integrate pieces of evidence from different research on a particular topic (Nunn & Chang, 2020). Nun and Chang (2020) added that the main function of a systematic review is to inclusively synthesize pre-existing evidence on a particular topic, offering a solid and direct summary of related studies. It plays an essential role in evidence-based practice by updating healthcare decisions, research priorities, and rule-making.

They aid in identifying gaps in the literature, finding the current knowledge condition, and directing future studies. Academic highlights its significance in methodological consistency. They also emphasize the necessity for a clear inclusion method, systematic search approaches, and solid assessment of the studies' quality to guarantee the validity and reliability of results.

There are different types of systematic reviews such as meta-analysis, scoping reviews, umbrella reviews, and living systematic reviews.

Meta-analysis

According to Duveneck (2015), meta-analysis is a statistical method utilized to unite the findings of different independent research on a specific topic to generate a quantitative summary. In this type of review, information or findings from diverse individual research are merged, examined collectively, and evaluated on different aspects like study quality and sample size (Cogaltay & Karadag, 2015).

Meta-analysis is significant, for it can offer a more solid and reliable evaluation of the effect of the size or the findings than any individual study. Through integrating findings from research, meta-analysis intensifies the power of statistics, develops accuracy, and reduces casual errors, hence enhancing the validity and generalizability of the findings of the collected research. In addition, it permits researchers to recognize patterns, sources of distinction, trends, and possible mediators of the effect among studies (Duvenecl, 2015).

Meta-analysis is specifically useful in fields where there exists a large body of research with different findings, or it is utilized in research that may lack efficient statistical power to identify minor effects. It also aids in resolving conflicts between studies and informs clinicians in making evidence-based decisions, policy making, and other different fields.

Scoping reviews

Scoping reviews are research methods for investigating the scope and complexity of literature on a particular topic, specifically in areas where the existing literature is

varied or uneven. It aims to offer an inclusive overview of the literature (Sharma & Goyal, 2023).

One important characteristic of this type of review is its wide research questions and inclusion method. Scoping reviews' purpose is to map out the base of research by recognizing different features of the topic being examined, like important notions, themes, concepts, and types of evidence. This method permits researchers to identify a broad scope of research, encompassing practical research, theoretical frameworks, and specialists' viewpoints, hence providing a more unified understanding of the topic under investigation (Pollock, Davies, Peters, Tricco, Alexander, McInerney, Godfrey, Khalil, Munn, 2021).

Furthermore, Pollock et al. (2021) argue that scoping reviews' purpose is to recognize gaps, contradictions, and fields for further research. By systematically investigating the extent of available pieces of evidence, researchers may recognize knowledge shortage, methodological constraints, and research purpose, hence keeping future research up-to-date.

Umbrella Reviews

According to Aromataris (2014) et al. the overview of reviews, also known as an umbrella review, depicts an inclusive integration of different findings from various systematic reviews and meta-analyses on relevant topics. Different than a traditional systematic review which focuses on combining main research, an umbrella review collects information from present systematic reviews to offer a wider perception of the evidence base. By summing up findings from various sources, an umbrella review provides an inclusive overview of the existing evidence, emphasizing areas of agreement, disagreement, and uncertainty in the available literature.

Umbrella reviews are significant since they can offer a high-level combination of evidence through various research and systematic reviews. By integrating the findings of various resources, umbrella reviews aid researchers in recognizing persisting trends and gaps in the literature. They provide perceptions into the strengths and validity of evidence on [articular topics, aiding researchers to make more knowledgeable decisions and prioritize areas for future research. In addition, umbrella reviews help to tackle inconsistencies in the findings of singular systematic reviews by assessing the wider evidence base and investigating possible sources of bias (Aromataris et al., 2014).

Choi and Kang (2023) add that academics highlight the strategic accuracy necessary for conducting an umbrella review to guarantee the reliability and validity of the findings. Like a traditional systematic review, the components of an umbrella review consist of a clear criterion for research inclusion, systematic search methods, and a solid assessment of the studies' quality. Furthermore, clear reporting of strategies and findings is essential for permitting readers to evaluate the generalizability and credibility of the review's findings. By abiding by a solid methodological standard, umbrella reviews offer essential perception into the general knowledge on particular topics, directing further research.

Living Systematic Review

According to Heron (2023) et al., an LSR, also known as a Living Systematic Review, is a pioneering method for systematic reviews that includes persistent updating of the review as new evidence exists. Different from a traditional systematic review, which is frequently implemented at a specific time and may rapidly become outdated because of the fast pace of research, LSRs aim at offering persistent, real-time integration of evidence. This lively procedure permits academics to stay up-to-date on

the latest findings in a specific domain, and it permits scholars to access up-to-date knowledge.

The primary aspect of LSRs is their repetitive nature. Instead of conducting an individual review and issuing the findings, LSRs encompass repeatedly revisiting and informing the review as new research is conducted. This persistent follow-up of the literature permits researchers and academics to integrate the latest evidence in their investigations, guaranteeing that the review stays relatable and knowledgeable with time. In addition, they frequently use innovative methods for data synthesis and demonstration, like visualization tools and interactive online outlets, to ensure consistent involvement with findings.

Living Systematic Reviews became popular in fields where evidence is continuously changing, like public health and healthcare. By offering timely updates to systematic reviews, LSRs allow clinicians, academics, and researchers to make well-informed decisions based on existing evidence. This method enhances the quality of delivering care and services to patients and students. However, it still has limitations such as resources, methodological considerations, and the necessity of a solid system for upgrading and generalizing review findings. Continuous research in this area aids in tackling these difficulties and progressing the field of evidence synthesis (Heron et al., 2023).

Table 1

Comparison between Systematic Review and Literature Review

Literature Review	Systematic Review
<ul style="list-style-type: none"> • A broader evaluation and summary of available literature on a specific topic. • Includes various sources such as journals, books, reports, and thesis dissertations. • Smoother methodology and quality assessment, allowing for more flexible integration of findings. 	<ul style="list-style-type: none"> • A comprehensive synthesis of pre-existing research evidence on a particular topic. • Conducted through a defined and systematic method, often involving systematic searches. • Strict inclusion and exclusion criteria, and quality assessment.

(Annous et al., 2022)

Literature reviews and systematic reviews serve different yet corresponding purposes in the field of research, each providing special considerations and advantages.

A systematic review is a thorough synthesis of pre-existing research evidence on a particular topic, implemented through a defined and systematic method (Siddaway et al., 2019). It frequently encompasses systematic research crosswise various records, clear exclusion and inclusion methods, inclusive evaluation of studies' quality through utilizing well-known instruments, and integration of findings using approaches like meta-analysis or narrative analysis. Through following strict processes, systematic reviews aim at minimizing bias and offering an objective summary of existing evidence, making them essential instruments for evidence-based research in domains like healthcare.

On the other hand, a literature review provides a wider evaluation and summary of available literature on a specific topic, including different sources like journals, books, reports, and thesis dissertations (Janardhanan et al., 2019). Literature reviews might not abide by a strict methodology and might include less systematic research and fewer quality assessments of chosen research. Integrating findings in a literature review

is frequently new and less structured in comparison to a systematic review, permitting more flexible and interpretive themes and arguments within the literature.

While the main aim of a systematic review is to offer an inclusive and objective summary of existing evidence for particular research questions, literature reviews aim to fulfill several purposes (Siddaway et. al, 2019). These purposes include offering background information on a specific topic, recognizing gaps in existing literature, and planning theoretical frameworks. Literature reviews might be exploratory and might not always aim at providing an overview of available literature; instead, they offer academics a wide comprehension of the existing state of knowledge on a particular topic, allowing them to generate a hypothesis, recognize research gaps, and navigate further research.

Tools for Systematic Reviews

In the domain of psychology and special education, researchers frequently use different tools to lead their way through systematic reviews. These tools are structured to assist researchers in implementing inclusive and methodological reviews of previously existing literature. Commonly utilized tools include The Campbell Collaboration (CEC), The Cochrane Collaboration, Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), and the Joanna Brigs Institute (JBI) (Kolaski et al., 2023).

The Campbell Collaboration offers systematic reviews of the influence of social interferences among different fields, encompassing special education and education. Researchers may select CEC resources and guidelines for their systematic reviews because of the institute's reputation for generating a well-evidenced synthesis (Boruch, Soydan & de Moya, 2002).

The Cochrane Collaboration is famous for generating systematic reviews and meta-analyses in the field of healthcare, but its outlines can also be implemented in educational psychology and special education inquiry. Cochrane's methods and standards make it well-known among researchers for its reliability and consistency (Akl et al., 2019).

Furthermore, PRISMA is a reporting guideline that outlines crucial aspects to involve when writing meta-analyses and systematic reviews. Researchers frequently utilize PRISMA to guarantee completeness and transparency in conducting their reviews and findings (Selcuk, 2019).

JBIR offers systematic review methods and resources designed for different healthcare disciplines, encompassing special education and education. Researchers may choose JBIR when directing systematic reviews in the domains because of their relevance and practicality (Munn et al., 2014).

Selecting a particular tool depends on aspects like the nature of the research questions, the availability of resources, and the expertise of team members. Selecting tools criteria includes considering the validity, reliability, and practicability. Validity refers to a tool's ability to lead to accurate and trustful systematic reviews, reliability refers to the tool's consistency in generating reliable results. In addition, practicability denotes the ease of a tool's utilization in directing the review procedure efficiently. However, researchers select tools that align with their research's purposes, provide solid guidance, and develop the credibility and transparency of the review's outcomes.

In addition, according to Cook (2014) et al. , the CEC standards highlight the practices that emphasize positive results for learners with unique qualities. Evidence of efficiency should be reinforced through significant statistics on learners' outcomes. Also,

practices supported by the evidence base should be in parallel with related frameworks and theories in special education. Theoretical foundations can offer the basis for why and how some practices are efficient. Lastly, studies involved in the evidence base should offer complete descriptions of the intervention, encompassing conduct fidelity, and other specific elements. Inclusive reporting improves clearness and promotes imitation.

It is worth noting that the present systematic review did not utilize the CEC guidelines as an evaluation tool, for the selected studies did not include interventions, also it is only used on quantitative and intervention studies. For example, Aliza et al. (2013), He (2014) et al., McCoach (2020) et al., and Buchet and Falk (2001) did not include descriptions of the included practices, and implementation fidelity did not apply to all studies. Consequently, the researcher decided to apply tools that are appropriate to the selected articles, which are the MMAT and the Quadas-II. However, in defining the constructs of ADHD, OE, and giftedness, various definitions emerged.

Conceptual Framework and the Constructs of OE and ADHD

Before the topic's exploration, it is crucial to establish a conceptual framework for understanding the key concepts of overexcitability and ADHD in the context of gifted learners.

The Concept of Giftedness

There is no common definition of giftedness worldwide, but over the last decade, numerous broad conceptions have been developed to identify its different features (Al-Hroub, 2014, 2012). Giftedness includes several exceptional skills that exceed typical growth norms, causing different definitions and methods in various academic and psychological settings. Understanding giftedness frequently imitates the

complicated interaction among affective, cognitive, and behavioral dimensions, which causes scholars to define the concept from various viewpoints (Al-Hroub, 2022, 2023).

The definitions of development are crucial for recognizing and promoting gifted learners, and essential to add to educational settings. By assessing various definitions and conceptualizations of giftedness, scholars can address the different characteristics and needs of gifted individuals in a more inclusive manner (Al-Hroub & El Khoury, 2018, Luor et al., 2021).

Through reviewing the various definitions of giftedness across different scholars, Marland (1972) stated that gifted children are recognized by qualified specialists based on special capabilities that allow them to attain higher levels of thinking. These children need educational plans that exceed ordinary school material to fully capture their potential and make beneficial contributions to themselves and society. High-performing learners have those through demonstrated achievement in different fields, encompassing specific academic aptitude, general intellectual ability, creative thinking, proficiency in visual and performing arts, and leadership skills.

Marland (1972) highlighted the contribution of specialists in recognizing exceptional abilities that exceed academic performances. Marland's definition emphasized the necessity for individualized educational plans and services that satisfy the special needs of gifted learners. Marland's method recognizes the variety of abilities and talents that gifted learners have across non-academic and academic fields.

Renzullis (1977) introduced the concept of an interaction among three key traits: above-average general ability, high levels of creativity, and strong task commitment. According to Renzulli (1977), giftedness is not simply defined by intellectual abilities, but it is also defined by the skill to think creatively and engage in difficult tasks.

Renzulli's model highlighted the significance of nurturing several dimensions of motivation and talent in recognizing gifted individuals.

Tannenbaum (1979) proposed eight types of developed talents that suggest possible giftedness. These talents include a broad range of creative and intellectual skills, encompassing generating creative ideas, solving complicated problems accurately, and excelling in domains of arts and human services. Tannenbaum's method emphasized the variety of gifted characteristics and indicated that giftedness can be presented in different forms and domains of accomplishment.

Gardner (1983) challenged the narrow emphasis of traditional IQ testing through his model of multiple intelligences by recognizing seven distinct types of intelligence. These encompass linguistic, spatial, logical-mathematical, interpersonal, naturalist, and bodily-kinesthetic intelligence. Gardner's approach identifies that people have various strengths and methods of learning, highlighting the significance of identifying different intellectual capabilities in academic contexts.

Sternberg (1985) introduced an inclusive method that encompasses synthetic, analytical, and practical domains of giftedness. Synthetic giftedness highlights creativity and the skill to cope with originality. Analytical giftedness includes traditional educational talent while practical giftedness emphasizes implementing intelligence sufficiently in reality. Sternberg's method highlighted the significance of incorporating these skills and signifying wisdom in making decisions and solving problems.

The Columbus Group (1991) also had its own definition of giftedness;

“Giftedness is asynchronous development in which advanced cognitive abilities and heightened intensity combine to create inner experiences and awareness that are qualitatively different from the norm. This asynchrony increases with higher intellectual

capacity. The uniqueness of the gifted renders them particularly vulnerable and requires modifications in parenting, teaching, and counseling in order for them to develop optimally” (The Columbus Group, 1991, as cited in Morelock, 1992, p. 14)

In their definition of giftedness, they also focus on the high levels of thinking skills that generate new experiences that are different from a normal individual’s cognitive abilities. Hence, this allows for changes in the way gifted individuals are treated, for they need a more specialized plan to cater for their needs. This definition of giftedness aligns with the definitions of scholars such as Sternberg (1985), Gardner (1983), Tannenbaum (1979), Renzullis (1977), and Marland (1972).

The aforementioned scholars provided a varied perception of giftedness, emphasizing the multidisciplinary nature of talent and intelligence. Together, these varied definitions add to an inclusive comprehension of gifted individuals, and they highlight the necessity for academic programs that promote these diverse capabilities and potential of gifted learners. Yet, the concept of giftedness varied across regions of the Middle East.

Different Conceptions of Giftedness Across Various Regions in the Middle East

The concept of giftedness in the Middle East, specifically in the context of the Arab and the Middle East, imitates a combination of Western effect and regional cultural viewpoints. Academics such as Khaleefa (1999) and Subhi-Yamin (2009) highlighted the necessity for a distinct Arab perspective of giftedness that is based on local culture and not derived from Western perceptions. They emphasized the dangers of blindly adopting Western definitions without adapting them to Middle Eastern cultural settings.

Subhi-Yamin (2009) identified that gifted learners in the Middle East frequently include criteria like high intellectual skills, task commitment, creativity, behavioral qualities, and in some Arab countries, particular academic achievement. However, high intellectual skills remain a dominant indicator of defining giftedness in the Arabian Gulf, emphasizing innovative data processing and problem-solving skills.

According to Elmenoufy (2007), in specific regions such as Egypt, definitions of giftedness emphasize exceptional academic performance credited to skills that surpass peers in specific academic settings. Similarly, in Iran, conceptions of giftedness highlight perceptions from literary works such as “The Gulistan”, emphasizing practical intelligence, sagacity, wit, and wisdom, while stressing both extrinsic and intrinsic features of giftedness (Karami & Ghahremani, 2016).

In Palestine, giftedness encompasses excellence in academic achievement, adaptability, asynchronous development (advanced academically but potentially lacking in social or physical development), and extrinsic motivation. In addition, in Palestine, giftedness includes excelling in academic contexts, extrinsic motivation, adaptability, and asynchronous development (Mansour, 2006).

The aforementioned conceptions highlighted how giftedness is perceived across several countries in the Middle East. They emphasize the cultural distinctions and highlight the necessity of a local comprehension of giftedness that integrates both Western and Middle Eastern viewpoints.

Tools for Identifying Giftedness

Identifying giftedness has gone through an important evolution over time, shifting from a narrow emphasis on IQ (intelligence quotient) test to a more inclusive method. Scholars like Terman (1954) and Hollingworth (1931) highlighted intellectual power, initially measured using IQ tests, as the basic foundational criteria for recognizing gifted individuals. This method

depended on individually conducted IQ tests like WISC-IV and the Stanford-Binet Intelligence Scale, which offered detailed evaluations of mental and intelligence levels. These assessments were beneficial in starting the primary standards for gifted recognition, leading to a further investigation into other qualities of giftedness (Al-Hroub & El Khoury, 2018b).

In addition, group IQ tests arose as an effective and sufficient alternative for recognizing gifted individuals in a broader context. For example, the Otis-Lennon School Abilities Test and the Cognitive Abilities Test evaluated cognitive abilities such as mathematics, reading, and problem-solving skills. Achievement tests like the Kaufman Test of Educational Achievement were used to evaluate students' academic abilities, offering a wider perception of giftedness based on academic achievements.

Scholars like Renzulli (1990) and Al-Hroub (2010a, 2010b, 2011) promoted a more inclusive method of gifted recognition, integrating behavioral rating scales, dynamic assessments, and creativity tests. Behavioral rating scales like the Scales for Rating the Behavioral Characteristics of Superior Students included evaluations from parents, teachers, and peers to recognize gifted characteristics that exceeded traditional IQ tests. Creativity tests such as the Torrance Test of Creative Thinking evaluated both non-cognitive and cognitive features of creativity, identifying that giftedness includes different talents and skills.

In addition, using parent, teacher, and peer recommendations arose as an important factor of gifted recognition, offering personal perceptions of students' traits and behaviors in different settings. Renzulli (1990) suggested a complex identification plan structures on evaluations, and parents being included to recognize giftedness thoroughly. Al-Hroub's (2014, 2021) multidimensional approach highlighted the

significance of dynamic evaluations, task analyses, and historical data in recognizing gifted learners, specifically those with learning difficulties.

The evolution of gifted recognition reflected a shift towards a more thorough and distinctive approach, identifying that giftedness exceeds IQ scores to include a range of skills, potential, and talents. Scholars such as Al-Hroub (2007, 2012), Renzulli (1979), and Hollingworth (1931) added to the progression of inclusive recognition models to highlight several dimensions of giftedness, aiming at recognizing and promoting gifted learners from different backgrounds and profiles. Each approach and instrument in gifted recognition is an essential component in the assessment of giftedness, fostering better inclusivity and equality in the field of gifted education. Another construct that is investigated in the current review is Overexcitability.

The Theory of Positive Disintegration and the Concept of Overexcitability

The Theory of Positive Disintegration (TPD), founded by Kazimierz Dabrowski, provides an inclusive outline to comprehend human progress, specifically in individuals with the intensity of experiences and heightened sensitivity, frequently denoted as overexcitability. The theory was formulated in the middle of the 20th century, and it was based on Dabrowski's observations as a psychiatrist and a psychologist (Mika, 2005).

Dąbrowski's TPD outlines five multi-levels of personality development and suggests that personal growth is a continuous journey involving the ascent through five levels of development, from primary integration to secondary integration (Ackerman, 2009). This cyclical process acknowledges that individuals encounter new challenges and engage in further positive disintegration as they progress described by self-awareness, ethical progress, and the progress of a solid sense of values and identity. Such individuals

aim at advanced stages of psychological maturity and self-actualization led by inner psychic tensions and conflicts. The five mult-levels are:

- **Primary Integration (Level I):** This is the initial stage of development where individuals function within societal norms and expectations. They exhibit a relatively stable and homogeneous personality.
- **Unilevel Disintegration (Level II):** In this stage, individuals start to experience inner conflicts and tensions due to discrepancies between their values and those of society. This disintegration leads to a breakdown of their former self.
- **Spontaneous Multilevel Disintegration (Level III):** Here, individuals undergo intense inner struggles, often experiencing heightened emotional sensitivity and increased introspection. This phase involves a profound reevaluation of one's values and beliefs.
- **Organized Multilevel Disintegration (Level IV):** In this stage, individuals actively work towards reconstructing themselves. They embrace values and ideals that align more closely with their authentic self, often transcending societal norms.
- **Secondary Integration (Level V):** The final stage involves the establishment of a new, higher-level personality structure that integrates the individual's deeper values and aspirations. This integration results in a more authentic and self-aware individual.

Dąbrowski's theory emphasizes that the journey through these levels is not linear and can involve periods of regression and growth. The theory suggests that inner conflicts and disintegration can lead to positive psychological development and personal growth.

Dąbrowski's theory postulates that individuals can exhibit heightened sensitivities, known as overexcitabilities (OEs), in different domains of their

psychological experience (Hull, 1996). These domains include psychomotor, sensual, intellectual, imaginal, and emotional aspects. Dąbrowski identified five types of overexcitability:

- **Psychomotor Overexcitability:** This refers to an excess of physical energy and movement. Individuals with psychomotor overexcitability often display high levels of energy, restlessness, and a need for physical activity. They may excel in activities that require coordination and physical expression.
- **Sensual (Sensory) Overexcitability:** Sensual overexcitability involves heightened sensitivity to sensory stimuli. Individuals with this overexcitability may be acutely aware of sounds, textures, tastes, and smells. They may seek out or avoid certain sensory experiences based on their intensity.
- **Intellectual Overexcitability:** Intellectual overexcitability manifests as deep curiosity, intellectual curiosity, and intense mental engagement. Individuals with this overexcitability exhibit a strong desire for knowledge, intellectual challenges, and complex problem-solving. They may become absorbed in intellectual pursuits and enjoy exploring abstract ideas.
- **Imaginational Overexcitability:** Imaginational overexcitability involves a rich and vivid imagination. Individuals with this overexcitability have a strong creative drive, enjoy fantasy and daydreaming, and often engage in artistic or imaginative activities. They may create elaborate worlds in their minds and have a penchant for storytelling and creativity.
- **Emotional Overexcitability:** Emotional overexcitability refers to heightened emotional sensitivity and intensity. Individuals with this overexcitability experience emotions deeply and passionately. They may be empathetic, compassionate, and

responsive to the emotions of others. They can also be prone to strong emotional reactions and may struggle with emotional regulation (Al-Hroub & Krayem, 2018, 2020).

These overexcitabilities are not inherently negative; instead, they represent heightened potentials that can contribute to creativity, personal growth, and rich inner life. Dąbrowski believed that these intensities could lead individuals to undergo positive disintegration and ultimately develop a more complex and integrated personality (Daniels & Piechowski, 2009). Accordingly, the link between overexcitabilities and personal growth is embedded in Dąbrowski's core concept of positive disintegration. Positive disintegration refers to the process of breaking down one's existing, often socially conditioned, self to reconstruct a more authentic and self-determined self. It is driven by inner conflicts arising from heightened sensitivities, which ultimately propel individuals towards higher levels of development (Tillier, 2006).

OEs in Gifted Learners

In the gifted education domain, the Theory of Positive Disintegration is an essential influence. Academics and researchers identify that many gifted individuals display characteristics of overexcitability, and they may make use of Dąbrowski's framework (Mika, 2005). By recognizing the progressive possibility intrinsic in overexcitability and promoting the notion of positive disintegration, academics can foster the social, emotional, and intellectual requirements of gifted learners. This viewpoint promotes a solid-based approach to education, emphasizing nurturing learners' special talents and smoothing their personal development and self-actualization (de Oliveira & Barbosa, 2014). Research showed that gifted individuals frequently show heightened sensitivities and overexcitabilities in different domains (Al-Hroub & Krayem, 2019).

For example, gifted individuals with psychomotor overexcitability may display traits such as irrational talking, pressure for action, restiveness, competitiveness, and alertness (Al-Hroub & Krayem, 2020). A gifted individual with sensual overexcitability displays some behaviors, like appreciation of beautiful items, music, and nature, sensitivity to foods and toxins, physical sensitivity, and craving for pleasure (Al-Hroub & Krayem, 2020). Intellectual OE includes deep curiosity, critical thinking, and passion for learning. Imaginational OE includes clear imagination, emotional connection to art, and creativity. Emotional OE encompasses intensive emotional sensitivity and fears (Piechowski & Wells, 2021).

OEs and ADHD Confusion in Gifted Learners

There have been a lot of misdiagnoses. When OEs in gifted and creative children to symptoms of ADHD are being compared, there is much similarity that may lead to misdiagnosis (Webb et al., 2016). Psychomotor OEs in a creative child could be mistaken for hyperactivity characterizing ADHD (Flint, 2001). Imaginational scenarios running through the mind of a creative child might be misbranded as inattention (Flint, 2001). Emotional intensity as an expression of emotional overexcitability in a creative child could be approached as the emotional over-reactivity of ADHD children (Flint, 2001). Sensual OEs that a creative child might manifest by looking at and admiring the shape of a flower might be taken as distractibility (Flint, 2001). An intellectually overexcitable child who might be thinking about moral dilemmas in their mind could seem inattentive to the outside observer (Flint, 2001).

Attention-Deficit Hyperactivity Disorder (ADHD)

Definitions of ADHD as per DSM-5

Attention-Deficit/Hyperactivity Disorder (ADHD) is defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), as a pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development (Berri & Al-Hroub, 2016a, 2016b). In the context of gifted learners, it is crucial to differentiate between characteristics of giftedness and symptoms of ADHD, as both can manifest in similar ways such as high activity levels or intense focus on areas of interest. The diagnosis of ADHD in gifted learners can be complex, as some of the behaviors associated with overexcitability may overlap with ADHD symptoms (Al-Hroub & Krayem, 2018).

Tools Used to Assess ADHD

As for assessment and criteria, the diagnostic criteria for ADHD have evolved over the years. The DSM-5 outlines specific criteria for ADHD diagnosis, including symptom lists divided into two domains: inattention and hyperactivity-impulsivity. For a diagnosis, individuals must exhibit six or more symptoms from either or both categories, with some symptoms causing impairment before the age of 12. However, these symptoms must be present in multiple environments and clearly interfere with social, academic, or occupational functioning.

The most recent versions of the DSM (DSM-5) and ICD (ICD-10 and ICD-11) offer standardized criteria for diagnosis. However, the complex presentation of ADHD and its comorbidity with other disorders make accurate diagnosis a challenging process. A study suggests the recent release of *DSM-5* is the latest update to ADHD nosology (Epstein & Loren, 2013). The *DSM-5* revisions include modifications to each of the ADHD

diagnostic criteria (A-E), a terminological change in the ADHD subtype nosology, and the addition of two ADHD modifiers (Epstein & Loren, 2013).

The long-term outcomes and quality of life in regard to ADHD have a long-standing literature. A growing body of research has focused on the persistence of ADHD into adulthood. Studies suggest that ADHD often continues into adolescence and adulthood, impacting academic, occupational, and social functioning (Young et al., 2011).

ADHD Symptoms

Research has emphasized the importance of assessing the quality of life in individuals with ADHD. Impaired quality of life is not solely linked to symptom severity but also to associated difficulties, such as academic underachievement, unemployment, and comorbid conditions (Halleland et al., 2019).

The core symptoms of inattention in ADHD include difficulties sustaining attention, organizing tasks, and completing assignments (Langberg et al., 2008). Children with ADHD may have trouble following instructions, frequently make careless mistakes, and struggle with tasks that require sustained mental effort. In adults, inattention can lead to problems with time management, organization, and meeting deadlines (Palmini, 2008). Impaired working memory often contributes to inattention in individuals with ADHD, affecting their ability to maintain focus on tasks.

Another symptom in the literature is hyperactivity. Hyperactivity refers to excessive motor activity, restlessness, and an inability to stay seated when expected (Barkley, 1982). In children, hyperactivity might be more noticeable, with constant fidgeting, running, and climbing in inappropriate situations (Stewart, 1970). In adults, hyperactivity

may manifest as inner restlessness, difficulty remaining seated, or the need to engage in multiple activities simultaneously (Asherson, 2005).

Impulsivity in ADHD is another symptom characterized by hasty actions, speaking without thinking, and difficulty waiting for one's turn (Islam, 2015). Impulsive behaviors might lead to social difficulties, including interrupting conversations, taking risks, and exhibiting impulsive decision-making (Sharma et al., 2014). In adults, impulsivity can result in impulsive spending, risky behaviors, and relationship conflicts (Schreiber et al., 2012).

Studies in the literature have also come to examine ADHD in children and adults. Children with ADHD frequently display symptoms that can interfere with their academic performance and social interactions (Loe & Feldma, 2007). Symptoms might differ in intensity, but they generally emerge before the age of 12 (Agnew-Blais et al., 2016). In children, ADHD may manifest as frequent forgetfulness, difficulty following rules, trouble organizing schoolwork, and poor peer relationships (Kumperscak, 2013). Gender differences are less marked in childhood, with similar prevalence, rates among boys, and girls. However, girls with ADHD may exhibit more inattentive symptoms, making their condition less recognizable (Quinn & Madhoo, 2014).

As for adults, ADHD could continue into adulthood, though its presentation can evolve. Adults with ADHD might have developed coping mechanisms, making inattention and hyperactivity less conspicuous. In adults, inattention can result in disorganization, difficulties with time management, and problems at work (Wilens et al., 2004). Impulsivity could lead to relationship conflicts, substance abuse, and impulsive career choices (Verdejo-García et al., 2007). Gender differences may become more

apparent in adults, with men tending to exhibit more hyperactive-impulsive symptoms, while women show more inattentive symptoms (Rucklidge, 2010).

In the area of gifted education, distinguishing between ADHD and characteristics of giftedness is paramount. Gifted individuals often display behaviors akin to ADHD symptoms, such as intense concentration in areas of interest or heightened energy levels.

However, these traits in gifted learners are typically situational and aligned with their domains of interest or talent, contrasting with the more pervasive and persistent nature of ADHD symptoms. Therefore, a nuanced understanding of these dynamics is essential for accurate diagnosis and effective support of gifted individuals who may also present with ADHD.

ADHD in Gifted Learners

ADHD in the context of gifted learners is a complex topic. The overlap of gifted characteristics and ADHD symptoms often creates challenges in diagnosis and support (Minahim, & Rohde, 2015). Researchers like Rinn and Reynolds (2012) have highlighted the importance of accurate diagnosis, recognizing that gifted children with ADHD may require unique strategies and interventions that consider their exceptional cognitive and emotional traits.

The coexistence of Attention-Deficit/Hyperactivity Disorder (ADHD) in gifted learners has been a subject of interest in the literature. While there is ongoing research, several key points and findings have been discussed in the literature about ADHD in gifted learners.

One main theme in the literature is the complex diagnosis of ADHD in gifted learners. Gifted individuals may exhibit behaviors that overlap with ADHD symptoms,

such as inattention, restlessness, and impulsivity (Webb & Latimer, 1993). This can lead to misdiagnosis or delayed diagnosis.

On the other hand, the literature also brings into conversation misdiagnosis and underdiagnosis. The literature highlights that gifted learners with ADHD are often misdiagnosed or underdiagnosed. Giftedness can mask the symptoms of ADHD, making it challenging for educators and clinicians to recognize the disorder. Conversely, ADHD symptoms may be wrongly attributed to giftedness, leading to an underestimation of the prevalence of ADHD in gifted populations (Hartnett et al., 2004).

As for unique presentations, other studies have found that gifted learners with ADHD may exhibit a unique presentation of the disorder. For example, they may demonstrate high levels of academic achievement but still struggle with executive functions, time management, and organization, suggesting that their giftedness and ADHD can coexist in a complex way (Hua et al., 2014).

Nonetheless, the literature discusses the dual exceptionalities of gifted learners with ADHD. They may possess intellectual strengths while grappling with the challenges of ADHD, such as inattentiveness or impulsivity (Wood, 2012). Understanding this duality is essential for educators and clinicians in providing appropriate support. Accordingly, research highlights that the treatment of ADHD in gifted learners may require different strategies. Medication and behavioral interventions should consider the unique needs of these students, including the potential for heightened sensitivities, intensities, and asynchronous development associated with giftedness. For this reason, studies call for the need for differentiated education and interventions for gifted learners with ADHD. This includes adapting curriculum and classroom strategies to accommodate their intellectual abilities while addressing their attention and focus challenges.

As for social and emotional aspects, studies delve into the social and emotional aspects of ADHD in gifted students. Coexisting ADHD can lead to emotional dysregulation, social difficulties, and perfectionism (Bodalski et al., 2023). Understanding these aspects is crucial for providing holistic support.

Furthermore, research suggests that gifted individuals with ADHD may face unique long-term outcomes. Their intellectual gifts may open doors to certain opportunities, but their ADHD symptoms can still impact their career, relationships, and overall quality of life (Doggett, 2004).

Also, Gomez (2020) et al. conducted a study investigating how overexcitability may influence the expression of ADHD symptoms in gifted students. The study sample consisted of both boys (N = 359) and girls (N = 148), which allowed for the examination of gender differences in the expression of inattention and hyperactivity/impulsivity among gifted children with and without ADHD.

The results indicate that when comparing gifted children with and without ADHD, the gifted/ADHD group showed higher scores for inattention, but their scores for hyperactivity/impulsivity were comparable. This suggests that inattention is more prominent among gifted children with ADHD, while hyperactivity/impulsivity scores are similar for both groups.

Their findings shed light on the complex relationship between these constructs. The study suggests that for gifted individuals who exhibit high levels of inattention (IA) and hyperactivity (HI), there is a need for careful consideration in the diagnosis of ADHD. The findings indicate that when a gifted individual meets the diagnostic criteria for ADHD, they should indeed be diagnosed with ADHD. This is because the study's

comparisons demonstrated that ADHD and giftedness are distinct conditions, even when high levels of IA and HI are present.

However, the study identifies specific ADHD symptoms that may be more useful for identifying ADHD in gifted children. In particular, the symptoms related to hyperactivity (HI) such as symptom numbers 12 (modulate motor activity), 15 (modulate verbal activity), and 16 (reflect on questions) may be particularly relevant in diagnosing ADHD among gifted children.

These symptoms could be considered secondary HI behaviors resulting from the need for higher stimulation in gifted individuals with ADHD. The practical implication of these findings is that clinicians diagnosing ADHD in children with high intelligence (giftedness) may need to pay special attention to these specific HI symptoms.

The study raises the interesting possibility that different diagnostic criteria, such as lower symptom thresholds, particularly for the HI symptom group, may need to be applied when assessing ADHD among gifted children.

Overexcitability and ADHD in Gifted Learners

As for empirical evidence regarding the relationship between overexcitability (OE), ADHD, and gifted learners in Jordan, several conclusions could be drawn. Al-Hroub and Krayem's (2020) study underscores that there is limited empirical evidence in Jordan addressing the coexistence of OE and ADHD in gifted students. This highlights the need for research in this specific context to better understand the interplay between these phenomena. The Canonical Correlation Analysis (CCA) in the study reveals a noteworthy collective relationship between OE and ADHD constructs. This suggests that there is a significant link between overexcitability and ADHD characteristics among gifted adolescents in Jordan.

Al-Hroub and Krayem's (2018) study also explores gender differences in OE profiles among gifted students. It indicates that there are significant variations in the profiles of OE between boys and girls. For instance, Psychomotor OE was found to be in favor of boys, while Emotional, Sensual, and Imaginational OEs were in favor of girls.

This suggests that gender plays a role in the expression of OE among gifted learners in Jordan. Accordingly, the findings in the study reveal small but significant correlations between specific OE forms and ADHD subtypes. For instance, there is a positive correlation between Psychomotor OE and hyperactive-impulsive ADHD, suggesting a potential connection between high physical energy levels and hyperactivity.

Imaginational OE is correlated with various ADHD subtypes, indicating that vivid imagination may influence different aspects of ADHD symptoms. On the other hand, Intellectual OE shows a small, significant negative correlation with inattentive ADHD scores, implying that certain intellectual traits may be associated with lower levels of inattentiveness.

Gender in the light of overexcitability and ADHD is a prominent point of examination in other studies. In the study of Bouchet and Falk (2001), the findings confirm previous research suggesting a relationship between giftedness and overexcitability.

Specifically, gifted students, as determined by their participation in a gifted, advanced, or standard curriculum program, scored significantly higher on intellectual and emotional overexcitability compared to students in the other two programs. This implies that gifted individuals exhibit greater intellectual and emotional intensity, which aligns with the concept of overexcitability. The study further reveals notable gender differences in the distribution of overexcitability traits. Males, on average, scored higher in intellectual, imaginational, and psychomotor overexcitability.

In contrast, females scored higher in emotional and sensual overexcitability. These findings suggest that gender plays a significant role in the expression of overexcitability traits among university students.

The study conducted by Rinn and Reynolds (2012) examined the relationship between ADHD and OEs in gifted adolescents. This investigation aimed at offering empirical evidence that supports the claim that some behavioral characteristics linked to giftedness can be manifested similarly to the symptoms of ADHD. Rinn and Reynolds (2012) used quantitative methods, utilizing valid scales and questionnaires to examine ADHD and OE in their selected sample. By tackling this gap, the study aimed to add to a comprehensive understanding of the overlap between giftedness and ADHD, which can be critical for precise diagnosis and intervention.

The findings of Rinn and Reynold (2012) suggested a relationship between ADHD symptoms and OEs in gifted adolescents. This supported the claim that gifted individuals may display some behavioral characteristics that can be misdiagnosed as ADHD. The findings highlighted the significance of considering OE as a possible contributor to behavioral displays in gifted individuals when distinguishing between ADHD and giftedness.

Other studies in this field explore the relationship between ADHD, creativity, and the potential overlap with characteristics of giftedness and overexcitability. Several key points can be inferred from the existing literature. Healey and Rucklidge's (2008) study acknowledges a theoretical link between ADHD and creativity.

They have suggested that certain symptoms of ADHD, such as inattention, hyperactivity, impulsivity, and unconventional thinking, may overlap with traits associated with creativity. For instance, inattention might be linked to divergent

thinking, while impulsivity could lead to novel ideas and unconventional problem-solving approaches. Moreover, Healey and Rucklidge (2008) have found some overlap in characteristics. Some symptoms of ADHD and traits associated with creativity are remarkably similar, as highlighted in the study.

These shared characteristics include inattention, hyperactivity, impulsivity, difficult temperament, deficient social skills, and academic underachievement. These qualities have also been recognized as indicators of creative potential. This overlap suggests that individuals with ADHD may possess creative talents.

Accordingly, Healey and Rucklidge's (2008) study raises the possibility that ADHD and giftedness may mask each other's traits. In some cases, the giftedness of an individual might overshadow their ADHD symptoms, while ADHD might obscure their creative gifts. This can create diagnostic challenges, as these children may not be identified correctly (Healey & Rucklidge, 2008).

Other studies in the literature provide valuable insights into the complex interplay among creativity, ADHD, and overexcitability, particularly in the context of gifted individuals. The study's findings of Mullet and Rinn (2015) suggest that many characteristics associated with giftedness can overlap with the symptoms of ADHD. This overlap raises the potential for the misdiagnosis of giftedness as ADHD. For instance, traits such as intense focus, unconventional thinking, and heightened sensitivity, which are common in gifted individuals, may be mistaken for ADHD symptoms like inattention and impulsivity.

In addition to the risk of misdiagnosis, there is also the possibility of a dual diagnosis of giftedness and ADHD. This means that some individuals may genuinely possess both characteristics. In such cases, it is important to differentiate between the traits that result

from giftedness and those associated with ADHD. Hence, the study reviews empirical research on the misdiagnosis, identification, and dual diagnosis of giftedness and ADHD. It examines diagnostic trends and challenges in distinguishing between these two conditions, shedding light on the difficulties in accurately identifying and labeling individuals with overlapping traits.

Empirically, the study reviews empirical findings related to dual diagnosis, providing insights into how giftedness and ADHD may coexist and manifest in individuals. This research helps in understanding the complexity of these co-occurring traits.

Gaps in the Literature

While the present systematic review aims at conducting an inclusive review of the available literature between 1990 and 2023 to assess the relation between OE and ADHD in gifted learners, multiple gaps in the available literature exist, which sheds light on standardized assessment tools and cultural and contextual aspects.

One noteworthy gap is the absence of standardized evaluation instruments particularly designed for diagnosing OE and ADHD in gifted learners. Available diagnostic instruments might not sufficiently identify the unique qualities and depiction of these cases in a specific population, making precise diagnosis and frequency difficult.

In addition, most research in the area of giftedness has been implemented in Western cultures, dominating the effect of contextual and cultural aspects on the depiction of OE and ADHD in gifted learners. Cross-cultural studies take place to investigate how cultural values, beliefs, and activities influence the representation of these cases, as well as the efficiency of interventions and support plans in various cultural settings.

The representativeness of the sample in various studies is another aspect that the present systematic review takes into consideration. Most times, the findings of a study can not be generalized over the whole population due to several reasons. One of them is the restrictions held within the selected sample in the study. Hence, investigating this feature in the present systematic review is essential to improve the quality of research in this field.

Tackling these gaps in the available literature is essential for progressing understanding and knowledge in the field of gifted education and psychology. By implementing a thorough systematic review that includes different methodologies, samples, and settings, academics can add to the progress of more precise instruments and culturally considerate practices that serve the needs of gifted students with OE and ADHD. Also, addressing these gaps will eventually improve the academic success, well-being, and academic encounters of gifted learners by directing the intricacies of such cases.

In conclusion, this literature review serves as a starting point in our quest to unravel the complexities of overexcitability and ADHD within the gifted learner population. By acknowledging the gaps in current research and emphasizing the need for further exploration, this study sets the stage for the systematic review, which will contribute to a more holistic understanding of this important intersection and its implications for the educational community. In the coming chapter, the researcher explains the methodology of the review, which includes the aims and research questions, research design, data extraction and analysis, quality assessment, diagnostic tools, procedure, and search strategy.

CHAPTER 3

METHODOLOGY

This chapter outlined the research design, method, and procedure employed to investigate and evaluate the available evidence for overexcitability and ADHD designed to address overexcitabilities in gifted students. It also discussed the criteria and guidelines used to assess the quality of evidence-based research.

Aims and Research Questions

The primary aim of this study was to thoroughly assess and synthesize existing research on overexcitability and ADHD in gifted learners, common characteristics and the diagnostic tools used. By synthesizing existing research, this study aimed to explore the constructs and diagnostic tools, the overlap between ADHD and OE, and the methodological quality and accuracy of the available studies between 1990 and 2023. Consequently, the most appropriate search strategy was a systematic review.

To do that, the systematic review employed PRISMA, which is used in systematic reviews to extract data that fall under the objectives of the study, also MMAT and QUADAS-2 guidelines were utilized to evaluate the quality and robustness of the existing research. To be able to evaluate and synthesize existing research on overexcitability and ADHD in gifted learners, research questions were carefully developed to align with specific aspects of the study. The four research questions guiding this systematic review were:

1. What are the available studies that explored the constructs of overexcitability (OE) and attention-deficit hyperactivity disorder (ADHD) in gifted learners,
2. What do we know about the diagnostic tools that were employed to identify ADHD and/or OEs in Gifted learners?
3. What is the empirical evidence present concerning the relationship and common characteristics between overexcitability and ADHD in gifted learners?
4. What are the methodological qualities of the available quantitative and qualitative studies as appraised by the Mixed Method Appraisal Tool (MMAT) guidelines, and the Quality Assessment of Diagnostic Accuracy-II (QUADAS-2) guidelines?

Research Design: Systematic Review Study

In the present systematic review, the purpose was to comprehensively assess and collect existing literature about overexcitability and ADHD in gifted learners. The study opted for the traditional type of systematic review due to its well-known methodology, encompassing sound search procedures and quality appraisal tools such as MMAT and QUADAS-2. Utilizing the aforementioned type of systematic review methodology allowed for an objective and structured evaluation of related studies, enabling an efficient address of the research questions. This allowed an inclusive exploration of the search strategy, data extraction, examination, and quality evaluation of the study.

The data for the current review was methodically collected, extracted, and synthesized by a cooperative effort between a master's student and a well-experienced researcher in the field of educational psychology, being specializes in gifted learning. Both figures secured the inclusivity and preciseness in collecting data, and findings

synthesis and promoting an inclusive comprehension of the diverse needs and characteristics of gifted learners in academic settings.

Search Strategy

The search strategy for the current systematic review involves multiple steps to ensure the inclusion of all relevant literature. Comprehensive searches will be conducted in several electronic databases, including PubMed, PsycINFO, ERIC, Scopus, and Web of Science, using a combination of keywords and phrases related to overexcitability, ADHD, and giftedness. The search was limited to peer-reviewed articles published in English to maintain the quality and reliability of the data. Inclusion and exclusion criteria were established to filter the studies based on relevance, methodological rigor, and contribution to the research questions. After identifying the search strategy, data extraction from different studies took place.

Data Extraction and Analysis

Once relevant studies were identified, data extraction began, focusing on key variables such as study design, sample size, measurement tools, and main findings. This process was systematically conducted using a standardized data extraction form to ensure consistency and accuracy in data collection. The extracted data were then subjected to a thematic analysis to identify mutual themes, patterns, and discrepancies across the studies. This analysis highlighted the relationships between overexcitability and ADHD in gifted individuals, providing a clear picture of the existing evidence and identifying areas where further research is needed.

For example, the study titled “Overexcitabilities and ADHD in Gifted Adolescents in Jordan: Empirical Evidence” by Al-Hroub and Krayem (2020) explored

the relation among overexcitability forms and ADHD types, in addition to gender variations in OE between gifted learners in Jordan.

The research was directed as an experimental study, it included 265 learners from grades 9 to 11 in Jordan, in Jubilee School, directing the Jordanian forms of the Overexcitability Questionnaire- Two (OEQII) and Conners ADHD/DSM-V Scales- Adolescents scale in Arabic. Findings from the Canonical Correlation examination displayed substantial relations among OE and ADHD concepts, with significant positive relations among particular OE forms and ADHD types.

The researchers observed gender differences in OE profiles, with more advanced Psychomotor OE in boys and higher levels of Sensual, Emotional, and Imaginational OEs in girls, while no noteworthy gender variations were detected in Intellectual OE. The study also investigated its limitations, encompassing the sample of the study being identified from one school, possible gender biases, and the design's inability to create causation. The findings added to the understanding of the overlap among OE and ADHD symptoms and highlighted the need for future research on identifying processes and the viewpoints of parents and teachers, in addition to the progress of culturally sensitive assessments. After extracting the data from the selected studies, the researcher assessed the quality of their methodologies using various assessment tools.

Quality Assessment

To assess the quality of the included studies, the Mixed Method Appraisal Tool (MMAT), and the Quality Assessment Tool for Studies with Diverse Designs (QUADAS-2) were utilized.

The Mixed Method Appraisal Tool (MMAT)

The Mixed Methods Appraisal Tool (MMAT) is specifically designed for the appraisal stage of systematic mixed studies reviews (i.e., reviews that include qualitative, quantitative, and mixed methods studies). The tool was initially developed in 2006 by researchers from the United Kingdom and Canada, then revised updated, and adapted to be used in different research settings, particularly health sciences (Hong et al., 2018; de Oliveira et al., 2021). It has undergone various revisions, with a significant update provided in 2018 to improve its usability and refine its criteria based on user feedback and the evolving needs of research methodologies (Hong et al., 2018). The MMAT allows for the simultaneous appraisal of qualitative, quantitative, and mixed methods studies, making it unique among appraisal tools (see Appendix 1). It is structured around a set of specific criteria tailored to the nature of the methodology being evaluated:

1. **Qualitative Studies:** For qualitative research, the MMAT focuses on aspects such as the appropriateness of qualitative methods, the relevance of data sources, the consideration of ethical aspects, and the importance of the findings.
2. **Quantitative Randomized Controlled Trials (RCTs):** The criteria assess the adequacy of the randomization process, the appropriateness of the study groups, and the management of withdrawals and dropouts.
3. **Quantitative Non-randomized Studies:** This includes an evaluation of the representativeness of the sample, the measurement of the interventions, and the appropriateness of the statistical analyses used.

4. **Quantitative Descriptive Studies:** For these studies, the MMAT focuses on the representativeness of the sample and the objectivity and reliability of outcome measurements.
5. **Mixed Methods Studies:** The criteria for mixed methods studies examine the integration of qualitative and quantitative components, the coherence of the methodology, and the significance of the integration in interpreting results.

Each section of the MMAT includes four specific questions that help reviewers assess the quality of studies. These questions are designed to be straightforward to apply, requiring only a 'yes,' 'no,' or 'can't tell' response, which aids in the swift appraisal of complex studies (Hong et al., 2018).

The validity and reliability of the MMAT have been subjects of ongoing evaluation. The revision of the MMAT has focused on its content validity and usefulness. The 2018 revision involved extensive consultations with methodologists and researchers, which helped enhance the clarity and relevance of the appraisal criteria. The tool's validity is supported by its ability to systematically and comprehensively assess different research designs and methodologies, which is critical for reviews that include diverse study types. Reliability testing has shown that the MMAT can be consistently applied by different reviewers, provided that they have a basic understanding of the different research methodologies. Training and guidelines provided in the MMAT manual further support the consistent application of the tool (Hong et al., 2018).

The Quality Assessment Tool for Studies with Diverse Designs (QUADAS-2)

The QUADAS-2 tool, short for Quality Assessment of Diagnostic Accuracy Studies, is an essential instrument designed to evaluate the quality and methodology of studies on diagnostic accuracy included in systematic reviews (Whiting et al., 2006).

This revised tool aims to provide a more structured and clear assessment process compared to its predecessor, QUADAS, which was initially developed in 2003 (see Appendix 2). The QUADAS-2 tool focuses particularly on the quality of the methodology used in diagnostic studies to ensure that the findings are reliable and applicable in clinical practice. QUADAS-2 consists of four key domains:

1. **Patient Selection:** This domain examines whether the study avoided inappropriate exclusions, whether the study population was appropriately described, and if the selection was done without knowing the results of the diagnostic test (avoiding bias). In adapting the description of the QUADAS-2 tool for the current study, it is important to note a terminology change where the word "patient" has been replaced with "participant." This change reflects a broader application of the tool beyond clinical settings to studies involving different populations, such as the current study.
2. **Index Test:** It assesses whether the index test was described clearly enough that it could be replicated, and if its results were interpreted without knowledge of the outcome of the reference standard.
3. **Reference Standard:** This domain checks whether the reference standard is likely to correctly classify the target condition and if it was applied uniformly to all patients.
4. **Flow and Timing:** This includes ensuring that there were appropriate intervals between the index test and reference standard and that all patients were included in the analysis.

Each domain includes signaling questions that help in judging the risk of bias and applicability concerns relating to these aspects. The answers to these signaling

questions are "yes," "no," or "unclear," indicating the level of risk associated with each domain (Whiting et al., 2006).

The validity and reliability of QUADAS-2 have been evaluated through various studies, showing that it generally provides a robust assessment of the quality of diagnostic accuracy studies. In an evaluation described in the document, three reviewers independently assessed 30 studies using QUADAS-2, with agreements between each reviewer and the final consensus rating being notably high: 91%, 90%, and 85% across all items. This suggests that QUADAS-2 is reliable when applied by different reviewers with varying levels of experience. Further, the tool's validity is supported by its systematic development process, which included a comprehensive review of existing evidence and a Delphi procedure involving a panel of experts in diagnostic research. This process ensured that the tool measures what it intends to measure, assessing the quality of diagnostic accuracy studies effectively (Whiting et al., 2006).

The aforementioned tools complimented each other, for each evaluated a certain aspect of the studies. For example, the QUADS-II assessed the participant selection, index test, reference standard, and flow and timing for the 13 selected studies. On the other hand, the MMAT assessed the research design, the sample's representativeness, data collection methods, and data analysis tools. These tools helped to evaluate the risk of bias and the applicability of the study findings to the research questions along with appraising the quality of empirical studies. The quality assessment informed the synthesis of evidence, ensuring that the conclusions drawn from the systematic review were based on robust and credible research. In addition, the Mixed Method Appraisal Tool allowed for the assessment of research based on experiment, simulation, and observation.

Synthesis of Findings

The final stage of the systematic review involved synthesizing the findings from the selected studies to draw comprehensive conclusions regarding overexcitability and ADHD in gifted students. This synthesis did not only encapsulate the breadth and depth of the research field but also illuminated the complexities and distinctions of this phenomena in the context of gifted education.

In the present systematic review, the researcher constructed various tables which included data from various articles. The MMAT findings were based on the research design, relevant questions, sample representativeness, and the generalizability of the results. Also, findings were categorized into yes, no, or unclear. The articles were assessed using a scale of percentages; 40% low quality, 60% moderate quality, 80% considerable quality, and 100% high quality. On the other hand, the QUADS-2 tables synthesized data such as the index test, the reference standard, and participant selection, along with flow and timing. The findings of this tool were categorized into yes, no, and unclear.

The synthesized evidence was critically discussed in relation to the theoretical frameworks and existing literature, providing a well-rounded understanding of the topic of the intersection between OE and ADHD in the field of gifted education.

Diagnostic Tools and Criteria for Identifying ADHD or OEs in Gifted

In directing the systematic review, particular diagnostic tools and criteria were precisely chosen to define important constructs like ADHD, giftedness, and overexcitability. These choices were made to guarantee that the research is based on reliable and broadly identified diagnostic frameworks, hence improving the findings' validity.

For ADHD, the DSM-5, and the Diagnostic and Statistical Manual of Mental Disorders were the main criteria. The DSM-5's inclusive and clinically legalized criteria for ADHD offered a standardized scale, confirming that the studies encompassed in the systematic review constantly diagnose ADHD based on worldwide identified standards. This selection is brought in line with the research purpose of comprehending ADHD in gifted learners, permitting a distinctive examination of how these criteria are implemented and understood in various research settings.

In addition, Overexcitability was identified through Dabrowski's Theory of Positive Disintegration, which provided a thorough framework for comprehending sharp sensitivities across different fields. This theory was selected due to its extensive implementation in studying gifted learners, providing a solid theoretical foundation for recognizing and examining overexcitability characteristics in the sample of the research. The definition of giftedness in the present systematic review was led by NAGC, the National Association for Gifted Children, which offered a wide and comprehensive definition that included both academic and non-academic talents. This method was chosen to recognize the different displays of giftedness, safeguarding that the study imitated the intricate nature of giftedness and how it interacts with ADHD and overexcitability.

The aforementioned definitions might not be traditional tools such as diagnostic and measurement scales, but they are still essential constituents of the systematic review procedure. They helped in forming the inclusion criteria for different studies, led the understanding of findings, and offered a theoretical foundation for comprehending overexcitability, ADHD, and giftedness. Hence, they played a crucial role in the systematic review, and they added to its validity.

Integrating these particular criteria and tools into the current systematic review methodology was essential for creating a consistent and clear framework for collecting data and analyzing them. This guaranteed that the systematic review inclusively recognized the complex relations between ADHD, overexcitability, and giftedness, leading to a deeper comprehension of these concepts and their implications in the academic and developmental settings of gifted learners.

Data Collection Procedure

The systematic review process involves several key steps for data collection:

Search Strategy

Studies investigating ADHD and OEs in gifted learners were reviewed and analyzed. To identify the relevant literature, six main databases were searched, namely, PubMed, Google Scholar, Education Research Complete, ERIC, Scopus, PsycINFO and Web of Science. The review was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2009). A thorough literature search was conducted using the online databases, was essential to guarantee the comprehensiveness and accuracy of the review procedure. The six databases were selected because of their wide coverage of academic literature in psychology, education, and relevant fields.

For example, ERIC and Education Research Complete are specialized in academic research, which makes them crucial for identifying related studies on ADHD and gifted learners. In addition, Web of Science and Scopus offered multidisciplinary reports, permitting admission to a varied range of peer-reviewed literature from different domains. PsycINFO, preserved by the American Psychological Association, emphasized psychology and relevant fields, making it essential for retrieving

psychological studies. These databases guaranteed an inclusive research method that included related literature from different viewpoints. Furthermore, it aligned with the study's research questions and purposes.

Sets of keywords were selected and agreed upon by two specialists in the field of special education and gifted education, and one librarian, who specializes in systematic review studies in the field of education.

Three sets of search terms were employed in the initial search, categorized under giftedness, attention deficit hyperactivity disorder (ADHD), and overexcitability (OE). For giftedness, the terms included "gifted," "talent," "genius," "creative," "highly able," "exceptional learners," "intelligent," "highly achieved," "academically advanced," "gifted student," "intellectually gifted," "academically gifted," and "gifted child." Keywords relevant to ADHD encompassed "ADHD," "Attention Deficit Hyperactivity Disorder," "inattention," "impulsivity," and "combined ADHD." For OE, the terms extended to "overexcitable," "emotional overexcitability," "sensory overexcitability," "imaginational overexcitability," "psychomotor overexcitability," "sensual overexcitability," "intellectual overexcitability," "personality development," "positive disintegration," "intensity in gifted individuals," "Dabrowski's theory," "emotional intensity," "sensory intensity," "imaginational intensity," "psychomotor intensity," "sensual intensity," "intellectual intensity," "psychomotor OE," "intellectual OE," "sensory OE," "sensual OE," "imaginational OE," and "emotional OE."

These terms were chosen because of their potential to produce a wide variety of papers and publications and their relevance in guiding academically gifted and talented adolescents. In addition to examining numerous databases, the study's reference lists were scanned to find any other studies that the initial search may have overlooked.

Inclusion and Exclusion Criteria

The study has established specific inclusion and exclusion criteria to ensure that only relevant, high-quality, and empirically based research on ADHD and overexcitability (OE) in gifted learners is analyzed. The inclusion criteria mandate that the studies be published in peer-reviewed journals to guarantee academic rigor. They should also be published within the period from 1990 to 2023, allowing an examination of both contemporary and historical perspectives across three decades. The focus is on empirical studies that specifically address ADHD and OE among gifted learners, ensuring the research is based on observed and measurable phenomena. All research methods are acceptable, encompassing qualitative, quantitative, mixed methods, and others, which allows for a comprehensive analysis across different scientific approaches. There is no restriction on study sample sizes, and the research must involve school and/or university students, thus focusing on educational settings where gifted learners are often studied. Furthermore, only studies published in English are included to ensure that the research is accessible and interpretable without translation barriers. Conversely, the exclusion criteria rule out articles that have not undergone peer review to maintain a standard of scientific integrity. Critical review articles that lack empirical data and dissertations or theses are also excluded to concentrate on studies published in more accessible and widely scrutinized forums. Books, book chapters, and book reviews are omitted, as these often provide extended discussions rather than direct empirical research findings. Additionally, the study excludes any articles published in languages other than English to avoid the complexities and potential inaccuracies involved with translation, ensuring clarity and precision in analyzing the data. These carefully defined criteria aim to collate a body of work that is both scientifically

rigorous and directly relevant to the phenomena of ADHD and OE in gifted educational contexts.

Table 3.1

Inclusion and Exclusion Criteria of the Study

Inclusion Criteria	Exclusion Criteria
(a) Peer-reviewed journal articles,	(a) non-peer review articles,
(b) Published during 1990-2023,	(b) critical review articles (non-empirical),
(c) Empirical study on ADHD, OE in gifted learners,	(c) dissertations or theses,
(d) All research methods,	(d) books,
(e) All study sample sizes,	(e) book chapter,
(f) School and/or university students,	(f) book reviews.
(g) A study published in the English language.	(g) articles published in languages other than English.

Data Screening

The initial step in the data screening process involves scrutinizing the articles identified through the comprehensive literature search. Articles were first assessed based on their titles and abstracts to gauge their relevance to the research questions. This preliminary screening was instrumental in narrowing down the selection to potentially pertinent studies. Full-text, peer-reviewed articles that passed the initial title and abstract screening were subsequently obtained for more extensive evaluation. This entailed a more in-depth examination of the complete articles to ensure they met the pre-established inclusion criteria.

The screening process was conducted by multiple members of the research team to minimize the potential for bias and errors in the selection of articles. This included the researcher and the research advisor. Any discrepancies or uncertainties that arose during this phase were addressed through discussion among team members. The systematic and rigorous screening process ensured that only articles that align closely

with the research focused on the intersection of overexcitabilities and Attention Deficit Hyperactivity Disorder (ADHD) in gifted students, and that employed a quantitative, qualitative, correlational and evidence-based approach, included in the review.

Additionally, adherence to the specified time frame for publication dates, language, and accessibility criteria played a pivotal role in shaping the final selection of articles. The exclusion criteria was accurately applied to eliminate studies that did not directly address the research questions or displayed a high-risk of bias.

Thus, the rigorous data screening process is foundational in maintaining the quality, relevance, and integrity of the studies included in this systematic review, contributing to the strength of the findings and the reliability of the conclusions drawn from the selected body of literature.

Quality Assessment

In evaluating the quality of the included studies for this systematic review, a structured and well-established framework was employed. The quality assessment tools that were used to evaluate the methodological rigour of each study are MMAT and QUADAS-2. The selected studies were quantitative, qualitative and correlational studies.

The Mixed Method Appraisal Tool

The MMAT was used to assess the quality of the selected studies. The Mixed Method Appraisal Tool is a broad tool that is intended to evaluate the methodological quality of different types of research like quantitative, qualitative, and mixed method research. It includes five main criteria.

First, it focuses on the research design, and it assesses the appropriateness of the study's design for answering the research questions and purposes. For sampling, the

MMAT tool assesses the tactics utilized to select participants in the study, and whether they are likely to be illustrative for the whole population or not.

In addition, the data collection standard measures the strategies applied to collect the study's data, and if they were appropriate for the research aims or not. The data analysis standard also sheds light on the suitability of the analytical methods used in the research, and whether they were consistent and valid. Lastly, it offers an assessment of the whole methodological quality based on the previous criteria

The MMAT delivers a systematic and inclusive method to assess the quality of studies, with clear guidelines for evaluating several structures of the study's research methodology. This approach advances the reliability of appraisals by ensuring that reviewers keep in mind all relevant methodological considerations continuously.

Furthermore, by evaluating the study's design, sampling strategies, and data analysis approaches, MMAT ensures that the involved studies are methodologically inclusive and able to produce valid findings. This advances the validity of systematic reviews and various research syntheses by eliminating research with methodological faults that could impact the reliability of the study's findings.

For MMAT, percentages were calculated based on the presence of the methods or not in the selected studies. The number of present standards according to MMAT guidelines in each study was divided by the total number of standards times 100. Percentages varied between 60%, 80%, and 100%, and each percentage depicted a category; 40% low, 60% medium, and 80%- 100% high.

QUADAS-2

The second Quality Assessment Tool used for the selected studies is the QUADAS-2. This tool is designed to assess the quality of primary diagnostic accuracy

studies. It consists of four key domains, and it helps in judging bias and applicability in diagnostic accuracy studies. The domains which are included in this tool are:

Participant Selection

Evaluated how participants were selected for the study. It assessed whether the selection procedure introduced bias by highlighting aspects like the recruitment method, exclusion and inclusion criteria, and any possible bias related to choosing participants. This analysis guarantees that the selected participants precisely depict the target population and that the study's findings are not excessively affected by the selection method. By cautiously assessing participants selection, the researcher aims to improve the generalizability and validity of the study's findings.

Index Test

Assessed the conduct and interpretation of the index test. It evaluated the validity and reliability of the test, in addition to any possible bias relevant to how the test was implemented by the researcher. The researcher assesses the implementation of the index test to recognize any possible biases that may influence the test's findings or understandings. By assessing the interpretation and conduct of the index test, the researcher can improve the quality of the study's diagnostic procedures and guarantee the accuracy of the findings. This assessment adds to the methodological quality and credibility of the research.

Reference Standard

Examined the conduct and interpretation of the reference standard. It assessed the validity and reliability of the reference standard, and it considered any possible bias relevant to its implementation and interpretation. The researcher assesses the application and interpretation of the reference standard to recognize any possible biases that might

affect the study's findings or conclusions. By assessing the interpretation and conduct of the reference standard, the researcher improves the credibility and quality of their study's diagnostic procedures. This assessment is essential for safeguarding the accuracy and reliability of the research results and adds to the methodological preciseness of the research.

Flow and Timing

Considered the flow of patients through the study and the timing of index tests and reference standards. It evaluated whether there were differences in tests' timings that could have introduced bias or influenced the validity of the study's results. In addition, it assessed whether there was missing information that could have influenced the findings' reliability.

Judging Bias and Applicability

The QUADAS-2 tool helped in judging bias by using signaling questions to highlight features of the study design that could introduce bias. These questions assisted reviewers in assessing the risk of bias in patient selection, index test conduct, reference standard interpretation, and patient flow and timing.

Concerns about applicability were also addressed by the tool, focusing on whether the included patients and the study methods aligned with the review question. By evaluating bias and applicability, researchers made informed judgments about the quality and relevance of the study findings.

For QUADAS-2, percentages were also calculated based on the quality of participant selection, index test, reference standard, and flow and timing. The studies were counted and identified if they followed accurate methodological structure according to QUADAS-2 guidelines. So, the number of articles that abided by the guidelines was

divided over the total number of articles times 100 to show the level of accuracy of their methodologies.

Data Synthesis

The data synthesis phase of this study played a pivotal role in distilling the wealth of information derived from the selected studies. This process involved a methodical and systematic analysis of the findings, ensuring that a comprehensive understanding of the complex interplay between overexcitabilities (OEs) and Attention Deficit Hyperactivity Disorder (ADHD) in gifted students was achieved.

Data from the selected studies were synthesized to identify common themes, patterns, and findings. The synthesis process allowed for a comprehensive understanding of the effectiveness and quality of evidence-based research on overexcitabilities and ADHD in gifted students. For the identification of themes, data from the chosen studies were examined to identify common themes and recurrent patterns. This step involved a careful review of the literature to pinpoint shared concepts, trends, and consistent findings related to OEs and ADHD. This thematic identification served as the strong basis for the synthesis process.

Beyond identifying common themes, the synthesis process also considered recognizing patterns within the literature. This entailed uncovering correlations, associations, and interrelationships between variables, including how specific types of overexcitabilities manifest in individuals with ADHD, and how these phenomena may impact academic and social outcomes.

For the analysis of the findings, the synthesis process encompassed an in-depth analysis of the findings from each study. This analysis extended to the quality of evidence, the strength of associations, and the implications of the research on

understanding the experiences of academically gifted and talented adolescents with overexcitabilities and co-occurring ADHD.

Furthermore, to explore potential variations and distinctions within the literature, subgroup analyses were conducted where relevant. These analyses considered factors such as the type of overexcitability, including emotional, intellectual, sensory, psychomotor, and imaginal, and the developmental stage of the participants, such as children, adolescents, or adults. Subgroup analyses allowed for a more nuanced understanding of how overexcitabilities and ADHD may manifest differently in distinct contexts.

The synthesis process integrated evidence from multiple sources to create a coherent and comprehensive overview of the current state of knowledge in the field. This integration aimed to build a unified narrative that gathers all the complexities and nuances of the relationship between overexcitabilities and ADHD in gifted individuals. Through the synthesis, emerging insights and potential research gaps were identified. These insights provided a foundation for drawing conclusions and recommendations and shaping the future direction of research in this area.

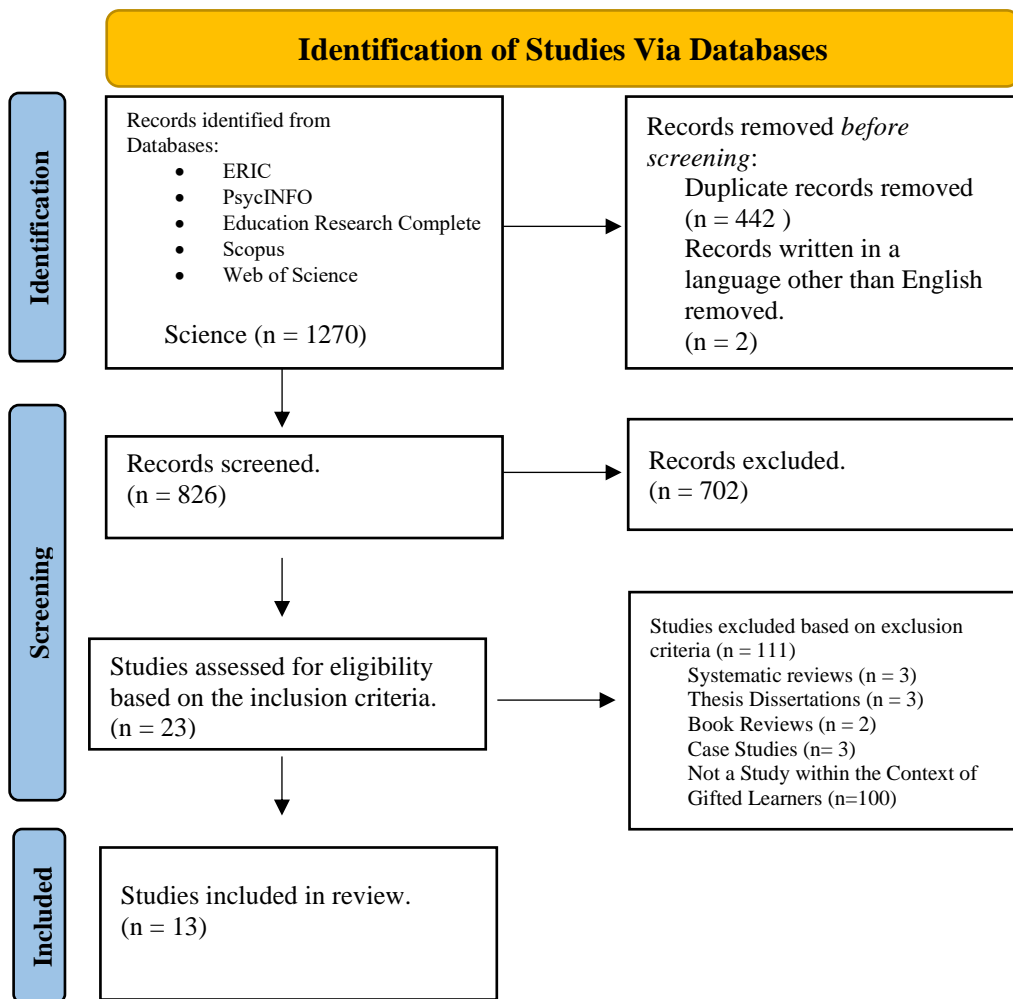
Search Procedure

- a) In the initial phase, databases were designated in order to search for the selected articles related to ADHD and OE in the gifted field. One thousand two hundred seventy (n=1270) results were found before choosing inclusion criteria. To narrow and be more precise, the titles and abstracts were screened and evaluated. After reading abstracts and titles, the inclusion criteria were set. total of 13 studies were recognized through database searches that were done in the years between 1990 and 2023. Title and abstracts were screened and the full-

text peer-reviewed articles were scanned and read. The peer-reviewed articles were screened and evaluated to determine if they met the inclusion and exclusion criteria that were reported in Table 3.1.

Figure 1

PRISMA Flow Diagram for Systematic Review



(McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, and Moher (2021).

CHAPTER 4

SYSTEMATIC REVIEW FINDINGS

The PRISMA diagram (Figure 1) summarizes information regarding the number of articles analyzed at each stage of the systematic review process, including how many articles met the study's inclusion criteria. The search yielded 1,270 articles. After the first screening 702 articles were excluded and 124 articles were reviewed for full-text screening. A total of 13 articles met the criteria after the full-text screening.

Exploring the Concepts of OE, ADHD, and Giftedness

Table 3 shows that while most studies provided definitions of OE, only two studies provided definitions of ADHD. Also, there were no explicit definitions of giftedness in the available studies as shown below:

The Concept of Overexcitability (OE)

Out of the six studies reviewed, all provided some form of definition for OE, highlighting its significance in the context of giftedness research. These include the studies by Aliza et al. (2013), McCoach et al. (2020), Al-Hroub and Krayem (2020), Buchet and Falk (2001), He Wong and Chan (2017), and He and Wong (2014).

The Concept of ADHD

Only two of the six studies offered explicit definitions or diagnostic criteria for ADHD, indicating a less frequent integration of standardized ADHD criteria in research focused primarily on gifted populations and OE. Specifically, Al-Hroub and Krayem (2020) used standard diagnostic criteria likely reflecting DSM-5 guidelines and the other study offering an ADHD definition was by McCoach et al. (2020), which focused on attention-deficiency/hyperactivity symptoms.

The Concept Giftedness

Definitions of giftedness were notably absent in the studies reviewed. Only one study, McCoach et al. (2020), indirectly referenced underachieving gifted students without a formal definition, suggesting a gap in the explicit characterization of giftedness within this body of research.

These findings underscore the variability in conceptual definitions across studies, which may reflect differing theoretical orientations or research objectives. The absence of standardized definitions, especially for giftedness and ADHD, could impact the interpretability and comparability of research outcomes in this field.

Table 3 also summarizes key findings extracted regarding the research methods, contexts, and participants' age groups. Here's a detailed report on these aspects:

Research Methods

Predominantly, the studies employed quantitative research methods, indicating a strong preference for numerical data and statistical analysis in exploring these phenomena. Studies by Aliza A. et al. (2013), D. Betsy McCoach et al. (2020), and Al-Hroub et al. (2020), among others, used this approach, allowing for measurable and replicable results. Fewer studies used qualitative methods, which involve more detailed descriptions and interpretations of behaviors and personal experiences. For example, the study by Tieso (2007) utilized a qualitative approach to explore in-depth perceptions and nuances of OE. Some studies, such as those by Al-Hroub et al. (2020), incorporated both quantitative and qualitative methods, providing a more comprehensive analysis that combines statistical with descriptive insights.

Research Contexts

Many of the studies were conducted within educational settings, such as schools or conferences for gifted children. For instance, Aliza et al. (2013) conducted their study in a school holiday camp, while McCoach et al. (2020) gathered data at the National Association for Gifted Children's annual conference in the United States.

The research spanned multiple countries (e.g., Jordan, USA, Hong Kong, Korea, China, Turkey, Brazil, and Malaysia), indicating a global interest in these topics. This also indicates cultural and regional differences in how these phenomena are perceived and studied.

Participants' Age Groups

1. **Children and Adolescents:** The age range of participants varied widely, predominantly including children and adolescents. This is consistent with the educational focus of many studies, as these age groups are critical for early identification and intervention. Aliza et al. (2013) included participants aged 10-15 years, while McCoach et al. (2020) covered a broader range of 9-17 years.
2. **Young Adults:** Some studies extended into older age groups, especially those conducted in university settings. For instance, Buchet and Falk (2001) included participants aged 17-50 years, providing insight into how OE and giftedness manifest and are managed in later educational stages and early adulthood.

This breakdown of research methods, contexts, and participants' age groups illustrates the diverse approaches and settings in which studies on OE, ADHD, and giftedness are conducted. The quantitative dominance in methods suggests a preference for statistical analysis, while the educational settings for most studies underscore the importance of these environments in researching developmental and cognitive

phenomena. The wide age range of participants reflects the continued interest in tracking these traits across different stages of development.

Empirical Evidence on the Overlap between ADHD and OEs in Gifted Learners

In examining the overlap between ADHD and overexcitability (OE) in gifted learners, several studies from Table 3 provide crucial insights into the interplay of these conditions. Five studies explicitly explored the intersection of ADHD and OE symptoms among gifted learners. The domains where overlaps were most frequently noted include *behavioral disruption, attention deficits, hyperactivity, and sensory-seeking behaviors*. *Gender-specific variations* were significant, such as noted in the study by Al-Hroub and Krayem (2020), where psychomotor OE was more prevalent in boys and variations in sensual, emotional, and imaginal OEs were more pronounced in girls. These findings shed light on how OE can sometimes be misinterpreted as ADHD due to behavioral similarities, especially in high-intensity environments typical of gifted education. Below is a detailed account of the five studies' findings.

1. Alias et al. (2013) conducted a quantitative study in Malaysia, observing that the heightened sensitivity and intensity associated with OEs in gifted students sometimes lead to mislabeling as ADHD, particularly through behaviors perceived as disruptive. This study suggested a potential intersection between ADHD symptoms and OEs, specifically within the context of behavioral disruption.
2. McCoach et al. (2020) explored ADHD symptoms in underachieving gifted learners in the United States. While the study did not specifically state a correlation between OE and ADHD, it noted a co-occurrence of ADHD

symptoms and underachievement among gifted students, indicating that features typical of ADHD are also prevalent in this specific population.

3. Al-Hroub and Krayem (2020) introduced "overexcitability" as the capacity for stronger neurological reactions in their study conducted in Jordan. The research highlighted the potential for confusion between imaginal OE and inattention, psychomotor OE and hyperactivity, and sensual OE and sensory-seeking behaviors, which are symptoms commonly associated with ADHD. The study also observed notable gender variations, with psychomotor OE more prevalent in boys and substantial differences in sensual, emotional, and imaginal OEs in girls, though no significant variations were found in intellectual OEs among all participants. This identification suggested a complex intersection between ADHD and OE symptoms in gifted youth.
4. Wood (2012) investigated teacher and parent perceptions of behaviors exhibited by gifted students referred for ADHD diagnosis in the United States. The findings indicated that primarily impulsive, inattentive, or combined ADHD behaviors are detected among gifted learners, supporting a possible correlation between characteristics of giftedness and ADHD symptoms.
5. Rinn and Reynolds (2012) conducted a correlational study in the Southern United States, noting that gifted students often have unusually high energy levels, intense imaginations, and highly sensitive and emotional dispositions. These characteristics mirror some ADHD symptoms, strengthening the link between ADHD traits and giftedness. The study's findings demonstrated significant relations among the psychomotor OE findings and the DSM-IV scores, sensual OE findings and the Conners' ADHD Index subscale findings,

imaginational OE findings, and multiple ADHD-related subscale findings.

Diagnostic Tools for OE, ADHD, and Giftedness

Table 4 shows the diagnostic tools used across different studies to assess overexcitability, ADHD, and giftedness. Several key findings emerge concerning the specific instruments utilized in the research as shown below:

Diagnostic Tools for Overexcitability (OE)

Overexcitability Questionnaire-Two (OEQ-II): This tool was frequently used across multiple studies, such as those conducted by Al-Hroub and Krayem. (2020), Buchet and Falk (2001), and He and Wong (2014). The OEQ-II is designed to measure five forms of OE and is widely recognized for its effectiveness in assessing heightened responses in gifted individuals.

Overexcitability Self-Evaluation Questionnaire: Alias et al. (2013) used this tool in their study conducted in Malaysia. It appears to be a self-report measure that helps individuals assess their own levels of overexcitability.

Overexcitability Scale/Semi-Structured Interview Script: Sousa and Fleith (2021) utilized this approach, combining a scale with interviews to gather detailed insights into emotional and sensory overexcitabilities among participants.

Diagnostic Tools for ADHD

Conners Third Edition Self-Report Scale (Conners 3): Al-Hroub and Krayem (2020) used this scale, which aligns with DSM-V criteria for ADHD. This tool is widely used in research and clinical settings to assess ADHD symptoms among children and adolescents.

ADHD-IV Tool: McCoach et al. (2020) employed this tool in their study, which is structured to align with the DSM-IV criteria for ADHD. It is particularly useful

in educational settings to identify potential ADHD symptoms in students.

Diagnostic Tools for Giftedness

Academic Achievement and IQ Tests: The study by Al-Hroub and Krayem (2020) used academic achievement scores and IQ tests alongside teacher recommendations to identify giftedness among participants. This method ensures a comprehensive assessment combining cognitive abilities and academic performance.

Creative Thinking-Drawing Production (TCT-DP): Used by He et al. (2017) in Hong Kong, this tool assesses creative potential, a key aspect of giftedness, particularly in how individuals express their creativity through drawing.

Raven's Advanced Progressive Matrices (APM): Employed by Guzel and Akarsu (2007) in Turkey, this non-verbal test is used to measure abstract reasoning and is considered a standard tool for assessing intellectual giftedness.

The studies reviewed utilized a range of diagnostic tools tailored to the specific traits being investigated—OE, ADHD, and giftedness. The use of well-established questionnaires like the OEQ-II and Conners 3 indicates a preference for standardized instruments that ensure reliability and validity in research. However, the diversity in tools, especially for assessing giftedness with creative and reasoning tests, reflects the multifaceted nature of giftedness itself. These findings highlight the importance of selecting appropriate diagnostic instruments that can accurately reflect the complex characteristics of the populations studied, providing a robust foundation for understanding and supporting the needs of gifted and potentially ADHD-affected individuals

Table 2

Definitions of overexcitability, ADHD, and giftedness

Journal Article	Author and Citation	Sample Size	Participant's Age	Method	Context	Overexcitability Definition	ADHD Definition as per the DSM-5 or other diagnostic criteria used in the study.	Type of giftedness (e.g., academically, artistically, IQ-based) identified in the study.
Dabrowski's Overexcitabilities	Aliza. et al. (2013)	335	10-15 years age	Quantitative	A school holiday camp for	OE is the heightened intensity and sensitivity displayed in the gifted students' behaviors when	Sometimes they are labelled	Being gifted does not mean the individual has high-intensity or sensitivity in his or her
Pay attention to inattention: Exploring ADHD symptoms in a sample of underachieving gifted students	McCoach et al. (2020)	212	9-17 years	Quantitative	United States in the National Association for Gifted Children's annual conference	NA	attention-deficiency/hyper activity	NA
Overexcitabilities and ADHD in gifted adolescent in Jordan	Al-Hroub & Krayem (2020)	265	14-18 years	Quantitative and correlational (Non-experimental)	Jordan-Jubilee Institute	"OE is a translation of a Polish term that means the capacity for stronger neurological reactions (Falk et al., 1994).	ADHD is a term used to describe children, adolescents,	NA
The relationship among giftedness, gender and overexcitabilities Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective	Buchet & Falk (2001)	562	17-50 years	Quantitative and qualitative	United States-Midwestern College	Means super stimulated	NA	NA
	He et al., (2017)	1055	12 to 16 years	Quantitative	eight secondary schools in various districts of Hong Kong	An individual's ability to be stimulated by and respond to both external and internal stimuli	NA	NA

Greater male variability in overexcitabilities: Domain-specific patterns	He & Wong (2014)	836	Mean age of 13.6 years	Quantitative	China, secondary schools subsidized by the government	Means to understand individual differences in intensity and sensitivity in responses to stimuli	NA	NA
Comparing overexcitabilities scores between STEM talented students and generally gifted students using QEQ-II A comparison of Dabrowski's overexcitabilities by gender for America and Korean high school gifted students	Imburgian (2014)	297	13-16 years	Quantitative	Illinois, USA.	Causes individuals to have intense reactions to daily life events, which incline them to experience life more deeply but also to have more persistent crises than their average peers.	NA	NA
Overexcitabilities: A new way to think about talent	Piirto et al (2008)	568	14-18 years	Quantitative	USA and South Korea	—An innate tendency to respond with heightened intensity and sensitivity to	NA	NA
Overexcitabilities: A new way to think about talent	Tieso (2007)	519	7-15 years	Qualitative	Five Diverse School districts throughout the east coast of the United States	The intensity often demonstrated by gifted	NA	NA
Examining parent and teacher perceptions of behaviors exhibited by gifted students referred for ADHD diagnosis using the Conners 3 (Exploratory study) Comparing overexcitabilities of gifted and non-gifted	Wood (2012)	21	Second or third grade (7-9 years)	Quantitative	One of the suburban schools in the United States of America	NA	Predominantly hyperactive/impulsive, predominantly inattentive, combined, and not otherwise specified	NA
	Guzel & Akarsu (2007)	711	15-19 years old	quantitative	Turkey	means 'superstimulability' in English	NA	NA

10th grade students
in Turkey

Emotional
Development of
Gifted Students:
Comparative Study
About
Overexcitabilities

Sousa & Fleith
(2021)

150
students+
6
teachers

11-17 years
old

Qualitative and
quantitative

Brazil
(Elementary
and High
School)

OE is characterized by the
release of emotional tension
through imagination,
expressed by the sharpness
and vivacity of images, the
use of metaphors in verbal
expression, sharp visualiza-
tions and inventiveness, but
also by nightmares, detailed
and vivid dreams, fear of the
unknown, predilection for
fantasies, imaginary friends
and poetic creativity

NA

With academic talent and
artistic talent

Overexcitabilities
and ADHD in the
Gifted: An
Examination

Rinn &
Reynolds (2012)

116

12 to 16
years old

Quantitative

A University
in the
Southern
USA

A sensual OE is
distinguished by heightened
pleasures via the sense.

Attention-deficit
hyperactivity disorder
(ADHD)

Gifted individuals often
have unusually high
energy levels, vivid
imaginations, and highly
sensi- tive and emotional
dispositions

Table 3

Diagnostic tools for overexcitability, ADHD, and giftedness

Journal Article	Author and Citation	Context	Overexcitability Diagnostic Tool	ADHD Diagnostic Tool	Tools mostly used	Gifted Diagnostic Tool
Dabrowski's Overexcitabilities profile among gifted students	Alias et al. (2013)	Local University in Malaysia	Overexcitability Self-Evaluation questionnaire	Study not focused on ADHD.	Overexcitability Self-Evaluation questionnaire	Selection based on participation in a holiday camp for gifted children, indicating recognition by educational criteria or standards of the hosting university in Malaysia
Pay attention to inattention: Exploring ADHD symptoms in a sample of underachieving gifted students	McCoach et al. (2020)	USA	Overexcitability Diagnostic Tool not specified in the article	ADHD-IV tool	ADHD-IV tool	Gifted Diagnostic Tool not specified in the article
Overexcitabilities and ADHD in gifted adolescents in Jordan	Al-Hroub & Krayem (2020)	Jordan	No diagnostic tool used. Overexcitability Questionnaire-Two (OEQII) to measure five forms of OE.	Conners Third Edition Self-Report Scale (ADHD/DSM-V)	Conners Third Edition Self-Report Scale (ADHD/DSM-V)	Academic achievement, IQ tests, and teacher recommendations
The relationship among giftedness, gender and overexcitabilities	Buchet & Falk (2001)	USA	Overexcitability Questionnaire II	ADHD-IV Rating Scales	Overexcitability Questionnaire II and ADHD-IV Rating Scales	gifted, advanced, or standard curriculum program
Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective	He et al. (2017)	Hong Kong	Overexcitability Questionnaire-Two	ADHD Diagnostic Tool not specified in the article	Overexcitability Questionnaire-Two	Creative Thinking-Drawing Production (TCT-DP)
Greater male variability in overexcitabilities: Domain-specific patterns	He & Wong (2014)	China	Overexcitability Questionnaire-Two	Not specified	Overexcitability Questionnaire-Two	Not specified
Comparing overexcitabilities scores between STEM talented students and generally gifted students using QEQ-II	Imburgian et al. (2014)	Illinois, USA.	Overexcitability Questionnaire-two	Not specified	Overexcitability Questionnaire-two	Enrollment at IMSA, indicating selection based on academic talent in STEM

A comparison of Dabrowski's overexcitabilities by gender for America and Korean high school gifted students	Piirto & May (2008)	United States and South Korea	Overexcitabilities Questionnaire II (OEQ II)	Not applicable	Overexcitabilities Questionnaire II (OEQ II)	Ohio educational standards and guidelines
Overexcitabilities: A new way to think about talent	Tieso (2007)	United States	Overexcitability Questionnaire II (OEQII)	Not Specified	Overexcitability Questionnaire II (OEQII)	Likert-type survey
Examining parent and teacher perceptions of behaviors exhibited by gifted students referred for ADHD diagnosis using the Conners 3 (Exploratory study)	Wood (2012)	United States	Not specified in the article	Conners 3 behavior rating scale	Conners 3 behavior rating scale	Not specified in the article
Comparing overexcitabilities of gifted and non-gifted 10 th grade students in Turkey	Guzel & Akarsu (2007)	Turkey	Overexcitability Questionnaire (OEQ)	Not applicable	Overexcitability Questionnaire (OEQ)	Raven Advanced Progressive Matrices Test (APM)
Emotional Development of Gifted Students: Comparative Study About Overexcitabilities	Sousa & Fleith (2021)	Brazil	Overexcitability scale/ semi-structured interview script	ADHD-IV Rating Scales	overexcitability scale and ADHD-IV Rating Scales	characterization questionnaires
Overexcitabilities and ADHD in the Gifted: An Examination	Rinn & Reynolds (2012)	Southern United States	Overexcitabilities Questionnaire–Two (OEQ-II)	Conners' ADHD/DSM-IV Scales–Adolescent (CADS-A)	Overexcitabilities Questionnaire–Two (OEQ-Conners' ADHD/DSM-IV Scales–Adolescent (CADS-A)II) and	Eligibility for talent search summer programs

Methodological Qualities of the Studies

Mixed Method Appraisal Tool Findings. The data extracted from Table 5 provides a comprehensive evaluation of studies on the relationship between OE and ADHD among gifted learners, providing insights into study objectives, participant demographics, methodologies, key findings, and overall evaluation scores. MMAT scores, which reflect methodological quality, range from 60% to 100%, indicating varying degrees of research rigor and precision. This categorization and evaluation based on the MMAT scores help in understanding the depth and reliability of the research conducted in the domain of OE, ADHD, and giftedness. The high-quality studies provide robust evidence that can inform educational practices and psychological evaluations, while medium-quality studies highlight areas for further research and refinement in study design.

High-Level Quality Articles (80%-100% MMAT Score). High-quality studies generally employed robust methodologies, clearly defined participant selection criteria, and thorough data collection methods. The findings are likely to be reliable and can significantly contribute to the academic discourse on gifted education and psychological assessment. In the current study, several high-quality articles stand out for their methodological rigor and depth of analysis, each scoring between 80% to 100% on the MMAT scale.

Aliza et al. (2013) received an 80% MMAT score and offered a comprehensive look at the overexcitabilities profile of gifted students, uncovering four distinct profiles with varying degrees of intensity across psychomotor, sensual, imagination, intellectual, and emotional domains. Conducted at a school holiday camp, the study highlighted that

a significant majority, 88%, exhibited high levels of overexcitabilities, underscoring the diverse educational needs of these students.

He et al. (2014) and Imburgian (2014) both also achieved an 80% MMAT score. He et al. examined gender differences in overexcitability, providing insights that could influence gender-specific educational strategies. Imburgian's study differentiated OE scores between STEM-talented and generally gifted students, noting that environmental and educational settings significantly impact these traits.

Sousa and Fleith (2021), with a perfect MMAT score of 100%, demonstrated exceptional methodological strength, revealing marked differences in OE patterns between gifted and non-gifted students. Their research emphasized the importance of recognizing and adapting to the psychological portrayals teachers hold regarding gifted students, advocating for the development of culturally adaptive educational assessments.

These studies collectively enrich the understanding of the OE and ADHD phenomena in gifted populations, offering substantial evidence to inform both academic research and practical interventions in educational psychology.

Medium-Level Quality Articles (60% MMAT Score). Medium-quality studies, while still providing valuable insights, might have some limitations in terms of sample diversity, sampling methods, or clarity in the interpretation of results. These limitations could potentially affect the generalizability of the findings. Table 4.3 shows that McCoach et al. (2020), Al-Hroub & Krayem (2020), Buchet et al. (2013), and Wood (2012) each scored 60%. These studies predominantly explored the behavioral and cognitive overlaps between OE and ADHD, with particular emphasis on educational settings and the need for specialized interventions. He et al. (2017) also scored 60% and

provided insights into the predictive relationship between OEs and creativity among students.

Strengths and Weaknesses. Based on the evaluation of the collected studies, the researcher identified several strengths and weaknesses. Studies such as Alias et al. (2013), He et al. (2014), and Imburgian (2014), demonstrated strength points in their transparent purpose and utilization of standard data collection methods, causing them to attain a high score of 80% on the methodological quality assessment. In addition, several studies like Wood (2012), Guzel and Akarsu (2007), and Rinn and Reynolds (2012) used standardized measures for data collection, adding to the accuracy of their methodologies. Also, studies like McCouch et al. (2020) and Sousa and Fleith (2021) used various measures and collected different viewpoints, that improved the inclusivity of their research methods.

On the other hand, studies displayed weak points. Studies such as Wood (2012), Guzel and Akarsu (2007), and Sousa and Fleith (2021) relied on convenience sampling, which posed limitations in generalizability because of sample selection biases. Some studies such as McCouch et al. (2020) and Rinn and Reynolds (2012) attained a low score of 60 %, for they lacked clarity in sampling methods, which hindered the representativeness of their sampling strategies. Studies implemented in particular settings such as He and Wong (2014) and He (2017) in Hong Kong encountered difficulties in generalizing the findings beyond their local context. Lastly, He and Wong (2014) and Guzel and Akarsu(2007) faced validity issues linked to translating assessment tools between different languages, which influenced the quality of their method.

Table 4

Data extraction for studies focusing on OE and ADHD in gifted learners

Author, year	Main Objectives	Participants, Study setting	Method of data collection and type of sampling	Key findings	MMAT Score*	Quantitative Indicator
Aliza et al. (2013)	<p>To identify:</p> <ul style="list-style-type: none"> the overexcitabilities profile of gifted students <p>To understand:</p> <ul style="list-style-type: none"> the heightened intensity and sensitivity displayed by gifted students in response to stimuli in their environment across five domains: psychomotor, sensual, imagination, intellectual, and emotional. <p>To explore:</p> <ul style="list-style-type: none"> the insights into the unique characteristics of gifted students 	<p>n= 335 students aged 10 to 15 years</p> <p>School holiday camp for gifted children at a local university in Malaysia</p>	<p>Purposive sampling: selected from a group attending a school holiday camp for gifted children at a local university in Malaysia.</p> <p>Questionnaire: overexcitability Self-Evaluation questionnaire in Malay Language</p>	<p>88% of gifted students exhibited at least one high level of overexcitabilities.</p> <p>Four distinct profiles of gifted students' overexcitabilities were identified: high imagination, all domains high, high psychomotor, and all domains low.</p> <p>Not all gifted students displayed high overexcitabilities, as shown in Profile 4.</p> <p>Each profile demonstrated unique characteristics that could impact the students' learning and social interactions.</p>	80%	High

and their potential developmental needs in educational settings.

McCoach et al. (2020)

To investigate:

- the prevalence of attention difficulties, particularly inattention, and hyperactivity, among gifted underachievers.

To examine:

- the relationships between attention difficulties, academic underachievement, and self-regulation in gifted students.

To assess:

- the impact of inattention on academic achievement and self-perceptions of self-efficacy, goal

n 212 students in Grades 5 and higher from 85 different. Students receiving special education services or identified with diagnosed learning disabilities were ineligible.

The name and location of the school were not stated.

Convenience sampling: participants were recruited through various methods, including distributing flyers at conferences, sending study advertisements to newsletters, and publishing study advertisements in newsletters.

Surveys: completed by teachers, parents/guardians, and students

Gifted underachievers showed higher rates of inattention in both home and school environments.

The prevalence of hyperactive behaviors was not significantly higher among gifted underachievers.

Inattention was strongly linked to self-regulatory factors like self-efficacy and goal valuation.

Specialized training for professionals is needed to identify gifted students with attention issues or ADHD.

60%

Medium

valuation, and self-regulation.

To explore:

- the potential need for specialized interventions for gifted underachievers with attentional issues, including ADHD considerations.

Al-Hroub & Krayem.(2020)

To examine:

- the relationship between characteristics of OE and symptoms of ADHD among gifted adolescents in Jordan.

To explore

- the gender differences in levels of OE among gifted

n= 265 gifted students (91 girls, 174 boys) at the secondary level from grades 9 to 11 at the Jubilee School in Jordan.

Jubilee School for Gifted and Talented Students in Jordan.

Convenience sampling: all students from grades 9 to 11 at the Jubilee School for gifted students in Jordan were invited to participate in the study. The sample primarily consisted of students from grades 9 to 11. Due to challenges in conducting surveys with grade 12 students who were busy with projects and examinations.

Questionnaire: Overexcitability

Teachers in Jordan were able to identify Imaginational OE in gifted students at the highest rate (61%), followed by Emotional OE (52%), Intellectual OE (44%), Sensual OE (41%), and Psychomotor OE (26%).

There was difficulty in differentiating between Hyperactivity and Psychomotor OE among teachers, indicating a need for clarification of ADHD and OE characteristics within each culture.

60%

Medium

adolescents in Jordan.

To investigate:

- the overlap between OE and ADHD characteristics to aid in the identification and support of gifted students.

To examine:

- the potential confusion between ADHD and OE characteristics among educators and the importance of recognizing and addressing these issues in educational settings.

Questionnaire (OEQII) and the Conners Third Edition Self-Report Scale (ADHD/DSM-V) in Arabic. In addition, a demographic questionnaire was completed by the students.

The study highlighted the importance of developing culturally sensitive and relevant assessments to aid in the identification and support of gifted students with OEs and potential ADHD symptoms.

Buchet et al. (2013)

To examine:

- the relationship between giftedness,

n= 562 university students, obtained from undergraduate classes at a large

Convenience sampling: 562 university students from undergraduate classes at a large midwestern university.

Gifted students scored significantly higher on intellectual and emotional overexcitability than students in either of the other two

60%

Medium

	gender, and overexcitability.	midwestern university.	Questionnaire: self-rating questionnaire, the Overexcitability Questionnaire.	programs (gifted, advanced, or standard curriculum).		
	To assess: <ul style="list-style-type: none"> the differences in overexcitabilities among students in gifted, advanced, and standard curriculum programs. 	Large midwestern university, primarily involving undergraduate classes in Introduction to Sociology and a few advanced sociology classes		Males scored higher overall on intellectual, imaginal, and psychomotor overexcitability.		
	To Investigate: <ul style="list-style-type: none"> gender differences in the expression of overexcitabilities. 			Females scored higher on emotional and sensual overexcitability.		
				The study confirmed previous findings on the relationship between giftedness and overexcitability.		
He et al. (2014)	To assess: <ul style="list-style-type: none"> the greater male variability hypothesis in the five domains of overexcitability (OE). 	n= 836 secondary school students in Hong Kong, with an average age of 13.6 years, consisting of 51% girls. The participants attended grades 7-9 and were from high-, medium-, and low-ability schools, representing a diverse range of academic abilities. All participants	Convenience sampling: 836 secondary school students voluntarily participated in the study Questionnaire: Overexcitability Questionnaire-Two (OEQII)	Greater male variability was found in the sensual, imaginal, and intellectual OE domains, while female superiority was found in the emotional domain.	80%	High
	To investigate: <ul style="list-style-type: none"> whether males exhibit greater inter-individual variability than 			The study highlighted the need to consider specific domains in determining cut-off points for admitting boys and girls to gifted programs and in		

	<p>females in the domains of OE.</p> <p>To examine:</p> <ul style="list-style-type: none"> the gender patterns in variability related to overexcitability, the study sought to contribute to the theoretical understanding of giftedness. <p>To explore:</p> <ul style="list-style-type: none"> the differences in overexcitability and their implications for gifted education. 	<p>were ethnic Chinese.</p> <p>Classroom environments (secondary school students) in Hong Kong</p>		<p>designing enrichment activities.</p> <p>The findings emphasized the potential role of socio-cultural factors in explaining gender differences in OE.</p>		
Imburgian (2014)	<p>To assess:</p> <ul style="list-style-type: none"> overexcitability Scores between STEM STEM-talented students and Generally Gifted Students using the OEQ-II. <p>To Investigate:</p> <ul style="list-style-type: none"> if characteristics of gifted students 	<p>n= 70 participants aged 13-16 (36 males, 34 females) who completed the questionnaire.</p> <p>Illinois Mathematics and Science Academy (IMSA), which is a</p>	<p>Random Sampling: Sophomore Navigation groups at the Illinois Mathematics and Science Academy.</p> <p>Questionnaire: Overexcitability Questionnaire-Two (OEQII)</p>	<p>Overexcitability scores were found to differ significantly between genders, with females demonstrating higher sensual and emotional overexcitability scores than males.</p> <p>Comparison with previously published data from Ohio gifted students revealed significant differences in overexcitability scores between IMSA students and their counterparts in Ohio,</p>	80%	High

remain constant across different countries.

residential high school.

indicating variations in overexcitability traits among different gifted populations.

To identify:

- the differences in Overexcitability Scores between genders.

The study found lower imaginal overexcitability scores among IMSA students, which could be attributed to their residential setting, focus on STEM education, and overall maturation compared to the Ohio student population.

To Explore:

- the implications of intellectual overexcitability on the educational interests of high school students.

IMSA students' high intellectual overexcitability scores align with the characteristics of STEM students, indicating a potential relationship between educational interests and overexcitability traits.

Piirto et al (2008)

To compare;

the levels of overexcitabilities (OE) in five specific areas (intellectual, emotional, sensual, imaginal, psychomotor) between American and Korean high

American High School Gifted Students: n= 227 identified gifted and talented high school students(Males (n=88), Females (n=139))
Setting: Ohio, USA

Korean High School Gifted Students: n=341

Purposive sampling: the participants met the criteria of being gifted and talented.

Questionnaire: self-rating questionnaire, the Overexcitability Questionnaire translated into Korean.

Korean gifted high school students showed less difference by gender in emotional and sensual overexcitabilities compared to American gifted high school students.

American students exhibited greater differences by gender in imaginal overexcitability compared to Korean students.

80%

High

	<p>school gifted students.</p> <p>To investigate:</p> <ul style="list-style-type: none"> the differences in gender-related patterns of OE between American and Korean students and the impact of cultural influences on the expression of OE in high-ability high school students from different backgrounds. <p>To examine:</p> <ul style="list-style-type: none"> how gender and cultural factors may influence the manifestation of overexcitabilities in gifted students from the United States and Korea. 	<p>high school students(Males (n=117), Females (n=224) from specialized high schools (science, foreign language, arts)</p> <p>Setting: Seoul, South Korea</p>	<p>Korean students demonstrated higher levels of psychomotor overexcitability than American students.</p> <p>No significant differences were found between American and Korean students in intellectual and emotional overexcitabilities.</p>			
Tiesco et al. (2007)	<p>To explore;</p> <ul style="list-style-type: none"> the concept of overexcitabilities as a new 	<p>n= 510 elementary and secondary students</p>	<p>Convenience sampling: of typical and gifted students was employed.</p>	<p>There are significant differences between males and females. Elementary and middle-school students and</p>	<p>60%</p>	<p>Medium</p>

	perspective on talent.			typical and gifted students on the composite OE subscales.		
	To describe:	Five diverse school districts throughout the East Coast of the United States.	Questionnaire: self-rating questionnaire, the Overexcitability Questionnaire	Females scored significantly higher on the emotional and sensual OE subscales than males.		
	<ul style="list-style-type: none"> how individuals with high levels of overexcitabilities may possess unique gifts and talents. 			There was a significant interaction between grade level gender and GT status.		
	To examine:			Gifted elementary-school students scored higher on all five OE subscales while typical middle school students scored higher on the sensual and imaginal Oes.		
	<ul style="list-style-type: none"> the implications of overexcitabilities for the field of gifted education and talent development. 					

Wood (2012)	To identify and examine:	n= 21 gifted students who may have ADHD. A sample of Project 2EXCEL, a larger research project concerned with the identification of twice-exceptional students.	Purposive sampling: participants were selected based on specific characteristics related to being gifted and potentially twice exceptional.	Statistical analysis revealed average scores in the ratings of parents and teachers in the areas of inattention, hyperactivity/impulsivity, executive functioning, and learning problems.	60%	Medium
	To analyze:	Several school systems surround a	Survey and Connors 3 rating scales: by the participants, which were carried out at a time and setting chosen by the participants themselves.	Parent and teacher ratings of these students were not significantly correlated, and there were no significant differences between parents		
	<ul style="list-style-type: none"> the parents and teachers' perceptions of these behaviors 					

To evaluate: the effectiveness of the Conners 3 assessment in identifying ADHD in gifted students

To investigate:

- the validity and reliability of behavior rating scales in identifying twice-exceptional students

major Midwestern city.

and teachers in the ratings of students.

Forty-eight percent of the participants had an educational placement described as cluster grouping within the regular classroom, and 52% received gifted services in a self-contained, advanced classroom.

The Conners 3 ratings of the gifted students did not differ significantly from the norm on several scales, including inattention and hyperactivity/impulsivity.

Guzel & Akarsu (2007)

To compare:

- the overexcitability scores between gifted and non-gifted 10th-grade students.

To examine:

- the relationship between intellectual abilities, motivation, creativity,

n= 50 10th-grade students from 25 different classes in 13 schools, with a total of 50 participants in the study.

Bogazici University in Istanbul, Turkey.

Convenience sampling: of 10th-grade students.

Questionnaire: Overexcitability Questionnaire-Two (OEQII) translated to Turkish. Raven Advanced Progressive Matrices Test (APM) to group students based on their intellectual abilities. The APM test, developed by Raven, Court, and Raven, consists of two sets (Set I and Set II) and aims to

Overexcitability scores of highly intelligent, motivated, creative, and leader students in some areas were significantly greater than those of their lower counterparts.

No gender differences were found in relation to overexcitabilities.

The Overexcitability Questionnaire (OEQ) was used to assess overexcitabilities, with higher scores on

60%

Medium

leadership, and overexcitabilities in students.

assess general intelligence and the ability to form new insights.

emotional, intellectual, and imaginal overexcitability areas obtained by gifted and creative subjects compared to non-gifted and non-creative counterparts.

To investigate:

- how overexcitability levels differ based on gender among 10th-grade students in Turkey.

To explore:

- the implications of the findings for understanding and supporting gifted students in educational settings.

Sousa & Fleith (2021)

To compare:

- the overexcitability of gifted, academically talented, and artistically talented students.

n= 150 students (divided into groups based on their artistic talents, academic talents, and non-gifted status). In addition, 6 educators participated in the study.

- participants' characterization questionnaires
- overexcitability scale (intended to identify the degree of expression of overexcitabilities (OE))
- semi-structured interview script (to investigate how

- The results indicated significant differences between gifted and non-gifted students in the patterns of intellectual and imaginative overexcitability.
- A tendency for teachers to emotionally characterize gifted students with an

100%

High

To investigate:

<ul style="list-style-type: none"> teachers' perceptions of their gifted students' emotional development. 	<p>108 from elementary school II and 42 from high school, 78 (52.0%) of whom were male, 70 (46.7%) female, and 2 (1.3%) from other genders, aged between 11 and 17 years.</p> <p>Setting: Brazil, academic setting not specified.</p>	<p>teachers perceive the emotional development of gifted students).</p>	<p>emphasis on psychological disorders and weaknesses.</p>
<p>To examine:</p> <ul style="list-style-type: none"> the potential impact of overexcitability patterns on the learning process and student engagement. 			

<p>Rinn & Reynolds (2012)</p>	<p>To examine:</p> <ul style="list-style-type: none"> the relationship between characteristics of overexcitabilities and symptoms of ADHD among the gifted. 	<p>Setting:</p> <p>summer program for intellectually gifted students held at a comprehensive university in the southern United States.</p> <p>Participants: n=116</p> <p>A total of 116 students participated in this study. Of these, 73 were male and 43 were female.</p>	<p>Participants were given a demographic questionnaire to assess gender and age, among other information.</p> <p>Overexcitabilities Questionnaire–Two (OEQ-II) was used to measure the five forms of overexcitability among participants.</p> <p>DSM-IV diagnostic criteria for Inattentive type ADHD.</p>	<p>No differences between males and females with regard to the four ADHD Conners subscales.</p> <p>Individuals with an imaginal overexcitability are most likely to display symptoms characteristic of ADHD, which would increase the likelihood of an ADHD misdiagnosis.</p>	<p>60%</p>	<p>Medium</p>
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		The mean age of the participants was 14.4 (SD 1.17), with a range from 12 to 16.				
He et al. (2017)	<p>To examine:</p> <ul style="list-style-type: none"> the relationship between overexcitabilities (OEs) and creativity from a Dabrowskian perspective <p>To Investigate:</p> <ul style="list-style-type: none"> the discriminative power of the Overexcitability Questionnaire–Two (OEQII) in identifying highly creative individuals. <p>To assess:</p> <ul style="list-style-type: none"> the contribution of each type of OE to creativity. <p>To explore:</p> <ul style="list-style-type: none"> the accountability of the five OEs 	<p>n= 1055 students, with 50.4% female participants, from grades 7 to 11.</p> <p>Students were recruited from eight secondary schools in various districts of Hong Kong.</p>	<p>Convenience sampling: method to recruit 1055 students from eight secondary schools in Hong Kong.</p> <p>Overexcitability Questionnaire–Two (OEQII) to assess overexcitabilities (OEs) and the Test for Creative Thinking–Drawing Production (TCT–DP) to measure creative thinking.</p>	<p>The five forms of overexcitabilities together explained 18.6% of the variance in creativity.</p> <p>Imaginational overexcitability was ranked as the most significant predictor of creativity, followed by intellectual, emotional, sensual, and psychomotor overexcitabilities.</p> <p>The Overexcitability Questionnaire showed significant discriminating power in identifying highly creative individuals with a 71.8% accuracy rate. These findings provide empirical support for the Dabrowskian perspective on the predictive role of overexcitabilities in creativity, while also enriching the understanding of the nature of creativity.</p>	60%	Medium

for variance in
creativity.

To extend:

- the understanding
of the predictive
relationship
between OEs and
creativity.

**MMAT Methodological Quality Assessment*

QUADAS-II Findings on the Diagnostic Accuracy Studies

The findings from the QUADAS-II tool to assess the quality of diagnostic accuracy studies. The tables detail the results across several key domains: Participant selection, Index Test, Reference Standard, and Flow and Timing. Each table categorizes responses into "Yes," "No," and "Unclear" based on specific quality assessment questions related to the study design and execution.

Table 6, detailing the Participants Selection findings, reveals that most studies, 69.23%, did not enroll a consecutive or random sample of students, with only 30.76% affirming that they did, which suggests potential selection bias. On a positive note, all studies, 100%, successfully avoided using a case-control design, which is considered optimal for reducing selection bias. In terms of exclusions, nearly all studies, 92.30%, avoided inappropriate exclusions, although a small fraction, 7.69%, remained unclear about this aspect. No studies reported potential biases in the selection of students, which fully aligns with the review question. However, a significant majority, 92.30%, of the studies expressed concerns that the included students matched the review question, indicating a significant alliance in the appropriateness of the participant pool.

Table 5

Participants Selection

Question	No		Yes		Unclear	
	Number	%	Number	%	Number	%
Was a consecutive or random sample of students enrolled?	9	69.23	4	30.76	0	0
Was a case-control design avoided?	0	0	13	100	0	0
Did the study avoid inappropriate exclusions?	0	0	12	92.30	1	7.69
Could the selection of students have introduced bias?	0	0	13	100	0	0
Are there concerns that the included students do not match the review question?	12	92.30	1	7.69	0	0

Table 7, which presents the Index Test findings, indicates that only 23.08% of studies managed to interpret index test results without knowledge of the reference standard results, while a significant proportion, 61.54%, were unclear about it. Regarding the prespecification of thresholds, most studies, at 76.92%, did not prespecify a threshold for the index test, which could potentially affect the objectivity of the results. In terms of bias, all studies reported no bias in the conduct or interpretation of the index test, indicating robust methodological execution in this aspect. However, a majority, 84.62%, of the selected studies aligned with the index test, its conduct, or its interpretation of the review question, which aligned with the application of the index tests relative to the intended study objectives.

Table 6

Index Test

Question	No		Yes		Unclear	
	Number	%	Number	%	Number	%
Were the index test results interpreted without knowledge of the results of the reference standard?	2	15.38	3	23.08	8	61.54
If a threshold was used, was it prespecified?	10	76.92	3	23.08	0	0.00
Could the conduct or interpretation of the index test have introduced bias?	0	0.00	13	100.00	0	0.00
Are there concerns that the index text, its conduct, or its interpretation differ from the review question?	11	84.62	2	15.38	0	0.00

Table 8, which focuses on the Reference Standard, shows that most studies, 76.92%, affirmed that the reference standard is likely to correctly classify the target condition. However, none of the studies managed to interpret reference standard results without knowledge of the index test results, which is crucial for avoiding diagnostic review bias. Despite this, nearly all studies, 92.31%, reported no bias in the reference standard or its interpretation. In addition, 15.38%, of the studies expressed concerns that the target condition as defined by the reference standard does not match the review question.

Table 7

Reference Standard

Question	No		Yes		Unclear	
	Number	%	No.	%	Number	%
Is the reference standard likely to correctly classify the target condition?	1	7.69	10	76.92	2	15.38
Were the reference standard results interpreted without knowledge of the results of the index test?	1	7.69	0	0.00	12	92.31
Could the reference standard, its conduct, or its interpretation have introduced bias?	0	0.00	12	92.31	1	7.69
Are there concerns that the target condition as defined by the reference standard does not match the review question?	11	84.62	2	15.38	0	0.00

Table 9 on the Flow and Timing, indicates that the majority, 84.62%, were unclear about whether there was an appropriate interval between the index tests and the reference standard, which is crucial for ensuring temporal validity. Most studies, 92.31%, ensured that all students received a reference standard, and a similar majority, 76.92%, applied the same reference standard to all students, maintaining consistency. Additionally, almost all studies, 92.31%, included all students in the analysis. Furthermore, all studies reported bias introduced by the flow of students through the study, marking a 100% biased student flow in the research process.

Table 8

Flow and Timing

Question	No		Yes		Unclear	
	Number	%	Number	%	Numer	%
Was there an appropriate interval between index tests and reference standards?	1	7.69	1	7.69	11	84.62
Did all students receive a reference standard?	0	0.00	12	92.31	1	7.69
Did all students receive the same reference standard?	2	15.38	10	76.92	1	7.69
Were all students included in the analysis?	1	7.69	12	92.31	0	0.00
Could the student flow have introduced bias?	0	0.00	13	100.00	0	0.00

The QUADAS-II Collected Findings on Methodological Quality

These findings highlight various strengths and weaknesses in the methodology of the studies assessed. The consistent application of reference standards and the inclusion of all students in the analysis are notable strengths. In addition, there were minimal concerns about the selection of participants, the alignment of tests with the review question, and the lack of blinding in interpreting test results, which indicated areas for minor improvement in future research designs.

The collected data provided perceptions into the methodological quality assessment between different domains, encompassing participant selection, index test, reference standard, and flow and timing. In the field of participant selection, it was noticed that 9 studies did not enroll random or consecutive samples of students. This absence of randomization might restrain the generalizability of its findings, for it may cause selection bias. Yet, all studies were able to successfully avoid the case-control design, suggesting a methodological strength in these aspects. In addition, the 12 studies

did not include inappropriate exclusions, signifying a solid participant inclusion method in most studies. Yet, one study had unclear exclusion criteria.

Despite these strengths, all articles were inclined to present bias in student selection, suggesting a possible restriction on participant employment. In addition, although 12 studies abided by the included students in the research questions, one study did not do that, indicating a possible disparity between the characteristics of participants and the research purpose.

As for the index test domain, 8 studies had unclear practices concerning understanding index test findings without knowing the reference standard. This absence could cause bias in the findings of each study. Furthermore, 10 studies did not specify the threshold for the index test, which might influence the reliability and constancy of measurements.

Also, all articles were disposed to bias in the interpretation of the index test, emphasizing a possible constraint for this aspect. Despite the aforementioned concerns, 11 articles had their index test brought to line with the research questions, suggesting the consistency of the methodology.

Concerning the reference standard, one study indicated that the reference standard was not known for the index test, while others were likely to accurately classify the target condition. Furthermore, 12 articles were disposed to bias in reference standards, interpretation, and conduct, indicating a possible constraint for this aspect.

2 studies did not match the target condition to the research question, suggesting a possible inconsistency between the identified target condition and research purposes. In the field of flow and timing, most of the articles had unclear practices concerning the

suitable interval between the reference standard and the index tests, possibly influencing the reliability of the examination.

However, 12 studies guaranteed that all students attained a reference standard and were involved in the examination, improving the strength of the findings of the study. Yet, all articles were disposed to bias in student flow, emphasizing a possible limitation.

To sum up, most studies confirmed to have strengths in certain methodological features, like staying away from case-control design and unsuitable exclusions. Also, there were noteworthy concerns when it comes to possible bias in participant selection, reference standards practices, index test interpretation, and flow of timing processes.

Summary of Key Findings

The collected data extracted from the MMAT findings offered varied perceptions of the relation between OE and ADHD among gifted learners, emphasizing primary research purposes, participants' demographics, methodologies, and study quality. MMAT scores ranged from 60% to 100%, which served as an indicator of research accuracy and rigor, allowing a distinctive assessment of the reliability of the selected studies in the gifted education field.

Studies with high-quality methodologies scored between 80% and 100%, like those by Aliza et al. (2013), He (2017), Imburgian (2014), Rinn and Reynolds (2012), and Sousa and Fleith (2021), which indicated sound methods with transparent participant selection strategies and inclusive data collection methods. These studies offered reliable perceptions of OE, ADHD, and giftedness, particularly adding to academic literature and informing academic practices. Remarkably, studies such as Sousa and Fleith (2021) scored 100%, which revealed an important difference in OE

patterns among gifted and non-gifted learners, highlighting the significance of culturally adaptive assessments.

Studies with medium levels methodologies, scored 60% on the MMAT scale, such as McCouch et al. (2020), Wood (2012), Guzel and Akarsu (2007), He and Wong (2014), and He et al. (2017), also provided essential perceptions but had displayed limitation in the selected samples, sampling procedures, and the clarity of findings. These studies highlighted the cognitive and behavioral overlaps between ADHD and OE, highlighting the necessity for individualized interventions and future research.

Strengths were recognized in the selected studies such as clear purposes, standardized data collection strategies, and thorough research methods utilizing various measures and perceptions. Yet, weaknesses like convenience sampling, vague sampling strategies, and validity concerns in translation affected the quality and generalizability of some studies.

Additionally, the QUADAS-2 tool was also used to evaluate the quality of the diagnostic accuracy studies, unleashing significant findings relevant to participant selection methods, index test interpretation, reference standard alignment, and flow and timing. These standards emphasize possible biases, methodological rigor, and areas to improve, safeguarding an inclusive assessment of reliability in OE, ADHD, and giftedness contexts.

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The achievement of scoring 100% on the MMAT by Soussa and Fleith (2021) exhibited a remarkable accomplishment in research methodology in the field of gifted education. This score emphasized the rigorous methodology adopted by Soussa and Fleith in their research on emotional development and OE among gifted learners.

Their alliance with all five methodological standards, encompassing accurate participant selection criteria, inclusive data collection and analysis methods, and the accurate co-existence of both research designs (quantitative and qualitative) improved the validity and credibility of their findings. Researchers can benefit from Soussa and Fleith's methodology to update and improve further research aimed at tackling the special needs of gifted learners.

However, studies with medium levels methodologies, scored 60% on the MMAT scale, such as McCouch et al. (2020), Wood (2012), Guzel and Akarsu (2007), He and Wong (2014), and He et al. (2017), also provided essential perceptions but had

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CHAPTER 5

DISCUSSION OF THE FINDINGS AND CONCLUSION

Through the utilization of various diagnostic instruments and methods, the present systematic review's investigation of OEs and ADHD among gifted learners revealed different challenges and complexities. This complex investigation required accurately identifying and assisting these challenges in an inclusive manner including enhancing research methods, diagnostic tools, and teaching strategies.

Constructs of OE, ADHD, and the Giftedness

The constructs of OE, ADHD, and giftedness were assessed in numerous studies with different methods and settings. For example, Aliza et al. (2013) emphasized identifying OE profiles of gifted learners, defining OE as heightened intensity and sensitivity in the learners' behaviors, which could lead to confusing it to ADHD because of behavioral likenesses. On the other hand, studies like McCouch et al. (2020) explored ADHD symptoms in underachievers without offering a particular definition of ADHD. Similar to MacCouch, Al-Hroub, and Krayem (2020) examined OE and ADHD symptoms in gifted learners in Jordan, highlighting possible misinterpretation of OE and ADHD symptoms. However, the aforementioned studies' findings aligned with the findings of Gomez et al. (2020) and Mullet and Rinn (2015), which suggest that due to the similar characteristics of OE and ADHD, misdiagnoses might take place in gifted individuals.

The definitions of giftedness offered by Marland (1972), The Columbus Group (1991), and the other viewpoints asserted in the studies by Aliza et al. (2013), Sousa and Fleith (2021), and Rinn and Reynolds (2021) indicated a complex field of understanding

giftedness. Marland's definition of giftedness highlights the recognition of talented children based on exceptional skills that allow high activities across different fields, necessitating special educational plans to assess their potential.

These definitions intersect in their emphasis on thinking skills, individualized educational plans, creativity, different skills, professional identification, and social influence, imitating an inclusive comprehension of giftedness which is based on the Overexcitability tools utilized, specifically Overexcitability Questionnaire-II, and they all align with Columbus definition.

On the other hand, definitions proposed by Aliza et al. (2013), Sousa and Fleith (2021), and Rinn and Reynolds (2021) introduced distinctive features of giftedness beyond traditional learning measures. Aliza et al. (2013) highlight the inclusion of academic abilities with artistic talents when defining giftedness, identifying the different talents that gifted learners might have, which is similar to the Columbus Group (1991) definition. Rinn and Reynolds (2012) extended their definitions to emotional and imaginative features frequently linked to gifted learners. Emphasizing the complex nature of their cognitive and affective skills.

In summary, in researching about giftedness, OE, and ADHD, a complex and overlapping landscape was revealed. Research done by Aliza et al. (2013), McCouch et al. (2020), and Al-Hroub and Krayem (2020) emphasized the possible overlap between OE and ADHD in gifted learners, leading to misdiagnosis. In addition, definitions of giftedness by Marland (1972), Columbus (1991), and researchers such as Aliza et al. (2013), Sousa and Fleith (2021), and Rinn and Reynolds (2021) highlight different cognitive skills, talents, and the necessity of individualized educational plans to cater for gifted learners. This inclusive comprehension of giftedness, evaluated using tools

such as OEQ-II, emphasized the significance of designed support and identification of different talents among gifted individuals to improve their academic and social experiences.

Instruments for Diagnosis and Methodological Variability

According to He et al. (2017), Buchet and Falk (2001), He and Wong (2014), Imburgian et al. (2014), Piirto and May (2008), Tieso (2007), Guzel and Akarsu (2007), and Rinn and Reynolds (2012), the OEQ-II, Overexcitability Questionnaire-Two, was mostly utilized, which suggested that the academic context found it to be a reliable tool for evaluating hypersensitivities that are parallel with Dabrowski's theory of positive disintegration. Despite this, the development of other instruments such as semi-structured interviews and the Overexcitability Self-Evaluation Questionnaire highlights the persistent effort to identify the distinct and diverse depictions of OE. In addition, the diversity of methodologies poses a critical standards challenge. These strategies' collection makes it difficult to compare the findings across the selected studies, which may hinder the results. The comparability and coherence of findings across the studies may be significantly enhanced by a sound effort to make these tools standardized or to offer clear guidance for their utilization.

Furthermore, according to Buchet and Falk (2001), Wood (2012), Sousa and Fleith (2021), and Rinn and Reynolds (2012), a strict method of cognitive assessment is represented by the utilization of DSM-aligned tools for ADHD diagnoses, like the Conners' ADHD/DSM-IV Scales or Conners 3 behavior rating scale, and this highlights an important diagnostic issue. Hyperfocus, a symptom that is often observed in gifted learners, might be mistakenly diagnosed as ADHD. Further studies should focus on enhancing these diagnostic standards, which might be by adding more identified

assessments that can differentiate between the characteristics of the aforementioned disorders.

In summary, the findings of the present systematic review indicated that several tools were utilized to assess the constructs of OE (OEQ-II, OE Self Evaluation Questionnaire, and Semi-structured interviews), ADHD (Conners' ADHD/DSM-IV Scales or Conners 3 behavior rating scale), and giftedness. The instruments varied from one study to another, which can affect the validity and the reliability of the studies' findings.

Identification of the Gifted

Studies on giftedness recognition such as Guzel and Akarsu (2007), Imburgian et al. (2014), and Rinn and Reynolds (2012) utilized different methods, like the Raven Advanced Progressive Matrices Test, basic conventions based on academic performance, and enrollment in specialized plans. The lack of consistency possibly disrupts the comprehension of the intersection between giftedness, OEs, and ADHD in addition to weakening the comparability of research outcomes. There must be a persistent methodology for identifying gifted learners. To represent the broad range of giftedness precisely like standardization might include a complex assessment that integrates both qualitative assessment and objective testing. This is parallel to the findings of Kettler and Bower (2017) who measured the relationship between teacher-rated creativity and rubric-scored writing samples among grade 4 gifted learners in Southern State. The utilized tool was teacher ratings on three different scales, and it measured the correlation between teacher evaluations of creativity and rubric-scored student writing samples. This supports the claim that the tools for measuring giftedness among gifted learners vary from one study to another, which affects the findings of

studies in the field of gifted education.

Methodological Issues

Utilizing PRISMA, QUADS-II, and MMAT instruments to evaluate the research methodologies of the selected studies identified noteworthy problems, particularly with the index test application and participant selection. While commenting on the methodological accuracy of the collected studies, a range of quality assessments across various research designs and sampling methods emerge. Studies scoring 80% or above in methodological quality, like those by Aliza et al. (2013), He (2017), Imburgian (2014), and Rinn and Reynolds (2012), frequently used standardized data collection methods adding to a higher-quality assessment.

On the other hand, studies that scored 60% (medium methodological quality), such as McCouch et al. (2020), Wood (2012), Guzel and Akarsu (2007), He and Wong (2014), and He et al. (2017), frequently depended on convenience sampling, which limited the generalizability of their results. The utilization of convenience sampling was observed as a mutual weakness in many studies, affecting their methodological quality. Sousa and Fleith (2012) scored 100% on their study, for they used various measures but depended on convenience sampling, imitating a balance between methodological accuracy and sample representativeness.

To illustrate, 9 studies did not use random sampling or sequential methods, which produced bias that may affect the findings' generalizability and implementation. Also, the accuracy of these assessments is complex because of the doubts about understanding the index tests in the absence of the reference standard.

The flaws concerning the methodologies followed required a more inclusive approach to the study design. Improving the reliability and validity of further research

necessitates applying well-defined, strict sample strategies and recognizing thresholds and methods for index tests.

The Empirical Evidence on the Overlap Between OE and ADHD

The empirical evidence exploring the overlap between overexcitability (OE) and attention-deficit/hyperactivity disorder (ADHD) in gifted learners provides valuable perceptions into the complex interplay of heightened sensitivity and attention difficulties within this population. This overlap in gifted learners identified an essential area of research within the current literature. Various studies contributed perceptions into the co-occurrence and possible misinterpretation of OE as ADHD symptoms between gifted individuals. Particularly, attention deficits, behavioral disruptions, hyperactivity, and sensory behaviors arose as key features where OE and ADHD are seen.

The relationship between ADHD and OE and giftedness was explored in studies like Imburgain (2014) and Rinn and Reynolds (2012), shedding light on comparing OE scores between various groups of gifted students and assessing the existence of ADHD symptoms in gifted people. Each study underscored the complex relationship between OE, ADHD, and giftedness, highlighting the necessity of distinct comprehension and standardized methods in further research to clarify these relations inclusively. However, the aforementioned studies' findings aligned with the findings of Gomez et al. (2020) and Mullet and Rinn (2015), which suggest that due to the similar characteristics of OE and ADHD, misdiagnoses might take place in gifted individuals.

Gifted individuals often exhibit characteristics of both OE and ADHD, where OE encompasses heightened intensity, sensitivity to stimuli, and emotional reactivity, overlapping with certain ADHD features like inattention or impulsivity. Understanding

this overlap is crucial for accurate identification and intervention, emphasizing the need for comprehensive assessments that consider both gifted-specific traits and potential neurodevelopmental conditions.

The discussion concerning the constructs of ADHD, OE, and giftedness is complex with varied points of view on the nature of the overlap of these constructs. Some questions about the existence of ADHD also add a layer of debate to the discussion. To tackle this overlap between these constructs, empirical evidence from research in the gifted field can offer essential perceptions.

Various studies emphasized in the discussion denoted substantial overlaps between OE characteristics and ADHD symptoms among gifted learners. For example, studies by Aliza et al. (2013), and Al-Hroub and Krayem (2020) highlighted how OE, specifically in the fields of psychomotor and imagination traits, can be misdiagnosed as ADHD because of behavioral similarities. Similarly, Rinn and Reynolds (2012) highlighted the clear imaginations and heightened energy levels frequently observed in gifted learners which replicate some ADHD symptoms.

This indicated that while ADHD, OE, and giftedness are different constructs, there is a noteworthy intersection characterized by common behavioral exhibitions. This emphasizes the significance of inclusive assessments and understanding of individual differences in gifted individuals to overcome misdiagnoses and offer planned support and interventions.

Educators can leverage this understanding by implementing differentiated strategies that accommodate OE strengths while addressing attention challenges, thereby optimizing educational experiences, and supporting holistic development in gifted learners with overlapping traits.

In summary, several studies from the selected sample had indicated that the overlap between ADHD and OE can result from the similar characteristics of both constructs in the context of gifted education. For example, OE psychomotor and imagination traits, can be misinterpreted as ADHD due to behavioral similarities as denoted by researchers such as Aliza et al. (2013) and Al-Hroub and Krayem (2020). Hence, it is recommended that these constructs receive standardized assessments, so the findings do not overlap between ADHD and OE.

Methodological Accuracy as per the MMAT Guidelines

What is the empirical evidence present concerning the relationship between overexcitability and ADHD in gifted learners, and how does this evidence add to the understanding and tackling of these conditions in the gifted education context?

The empirical evidence regarding the relationship between OE and ADHD in gifted students, assessed using the MMAT guidelines, offered perceptions into the methodological quality of different research and their contributions to comprehending and tackling these conditions in the setting of gifted education.

Piirto et al.'s (2008) research used quantitative descriptive research methods, suggesting strong methodological quality. The sampling strategy was reliable, but limitations were noted because of the educational settings as it took place in a limited context, which is the United States and South Korea. The measurements and statistical examinations were suitable, with the researchers using MANOVA and follow-up univariate assessments. The findings of Piirto et al. (2008) can't be generalized to a broader context, for it specifically took place in the USA and South Korea, so the results cannot be applied to the Middle East setting, for example, which limited the generalizability of the results.

Also, Guzel and Akarsu's (2007) study exhibited a strong methodological approach, using identified research tools like the Raven Advanced Progressive Matrices Test and the OEQ-II. Yet, limitations were recognized in the sampling strategy, possibly causing bias. The researcher also translated the data collection toll from English to Turkish, which possibly influenced the accuracy of the OEQ-II questions. Imburgiaby's (2014) study displayed clear research questions and suitable data collection methods, encompassing the utilization of Overexcitability Questionnaire-II and MINITAB software. The sampling strategy included sophomore students at IMSA, but the generalizability of the findings was restricted since the study was conducted in a residential school in Illinois, and the sample included 70 participants aged between 13 and 16.

In addition, the Aliza et. al (2013) study offered perceptions of overexcitability among gifted learners, but the research questions were not clearly stated, which affected the accuracy of the study. The sampling strategy captured different overexcitability levels but did not fully depict all gifted learners since it took place in a local camp in Malaysia. Sousa and Fleith's (2021) study established a strong methodology, utilizing a mixed-method approach to investigate the emotional aspects of gifted learners. The mixture of qualitative and quantitative research designs offered inclusive perceptions of the research purpose.

Alongside the aforementioned studies, Wood's (2012) study used a relevant sampling strategy and suitable measurements, but it lacked tackling the risk of nonresponse bias. Yet, the statistical examination was brought into line with the study's research questions, providing perspectives into the behavioral characteristics of gifted learners. He and Wong's (2014) study analyzed gender differences in OEs among

secondary school students, suggesting a strong methodology, but it lacked explicit research questions, which led to confusion while reading the study. The sampling strategy was relatable, but the representativeness of the sample was limited since it took place in local schools in Hong Kong.

Tieso's (2007) study also missed clear research questions, but it offered relatable data collection methods. Yet, limitations in the representativeness of the sample and bias were noticed. Rinn and Reynold's (2012) study assessed OE and ADHD symptoms among gifted adolescents, displaying solid data collection methods and measurements. Similar to Tieso's (2007) study, it included limitations concerning the sample's representativeness. Al-Hroub and Krayem's (2020) study highlighted the link between OE characteristics and ADHD symptoms among gifted learners in Jordan. Also, the representativeness of the sample was limited to Jordanian in the study's context only, but its sampling method was relevant to answering the research questions.

He et al.'s (2017) study displayed strengths in answering its research questions and using appropriate measurements and statistical examination. Yet, limitations in sample representativeness were noticed. McCoach et al.'s (2020) study assessed ADHD symptoms among gifted underachievers, displaying strengths in data collection methods and measurements. Like most studies, the sample representativeness was limited to the study's sample. Bouchet et al (2015) study drew on its objectives efficiently and used appropriate measurements and statistical examination.

In summary, the findings of the MMAT indicated that most studies' findings were limited due to the sampling methods used throughout the research procedure, however, one of the studies received 100% as an evaluation due to its abundance to the

mixed method research design rules, where the quantitative and qualitative research designs complemented each other to answer the study's research questions.

Methodological Accuracy as per the QUADAS-2 Guideline

What empirical evidence in the literature exists on overexcitability and ADHD in gifted learners according to QUADAS-2 guideline?

Based on the guidelines of QUADAS-II, empirical evidence in the literature on OE and ADHD in gifted students indicated various methodological strengths and restrictions among various domains.

Concerning participant selection, most articles established strengths by staying away from using case-control design and containing few inappropriate exclusions, which suggested string participant inclusion strategies. Yet, most studies did not conduct a consecutive or randomized sample selection of students, possibly restricting the generalizability of results and causing bias in sample selection. Furthermore, some articles displayed bias in student selection, which could limit participant selection, while only one study did not bring participant characteristics in line with the study's research questions, suggesting a potential gap.

As for the index test, most studies brought the index test in line with the research questions, indicating methodological consistency, but there were many limitations. Most of the studies had unclear practices regarding comprehending index test results without previous knowledge of the reference standard, possibly causing bias. In addition, most studies did not particularly specify the index test threshold, which might have influenced the consistency and reliability of measurements. All articles were likely disposed to bias in interpreting the index test.

For the reference standard, most articles categorized the targeted condition, but there were limitations. One study did not identify its reference standard for the index test, while the rest displayed bias in interpreting and conducting the reference standard. Also, two studies did not parallelize the target condition to the study's research questions, suggesting a potential inconsistency.

Furthermore, most studies ensured that all students received a reference standard and were included in the assessment, enhancing the foundation of the findings, but there were limitations. Many studies had vague practices regarding the interval between the index tests and the reference standards, possibly influencing assessment reliability. All studies were faced with bias in student flow, suggesting a potential limitation.

In summary, according to the findings of QUADAS-II, most of the studies displayed strength in particular methodological aspects like avoiding inappropriate exclusions and case-control design, but there was a noteworthy worry concerning potential bias in reference standard practices, student selection, index test interpretation, and flow of timing procedures. These restrictions are to be addressed to improve future research.

Conclusion

Overexcitability and Attention Deficit Hyperactivity Disorder in gifted learners were the primary focus of the current systematic review which highlighted the significance of methodological and diagnostic challenges in this field. The utilization of various tools to assess OEs and ADHD highlighted how challenging it is to distinguish between these constructs and precisely recognize gifted individuals who may have these characteristics.

The findings of the current review highlighted the need for more thorough, standardized research processes to ensure the reliability and validity of findings. In order to enhance the understanding of these groups, standardization of diagnostic tools and standards for identifying giftedness is crucial. To limit biases and enhance the generalizability of findings, it is essential to use sound sampling methods to establish solid procedures. Transparent reporting of strategies also makes it facilitative to imitate research and validate findings, adding to the more widespread information.

In addition, through the expansion and improvement of the existing literature on instructional and diagnostic methods, it can better satisfy the various needs of gifted individuals and ensure that they receive the assistance they need to prosper at academic and personal levels.

Defining OE, ADHD, and giftedness in the selected studies, revealed essential distinctions in comprehending these constructs in the gifted context. OE, as described across different studies, stresses heightened intensity, sensitivity, and responsiveness to triggers between different people.

This description suggested that giftedness might include a special tendency to have deeper emotive encounters and clear imaginations. In contrast, ADHD was defined based on standard diagnostic criteria like those planned by DSM-5, including symptoms relevant to attention deficit, impulsivity, and hyperactivity. Giftedness is defined as having an academic or artistic talent, and it does not have to be linked to high or energy sensitivity levels. These definitions are too broad to be accurate, and they vary from one study to another. Hence, a standard definition should be generalized and applicable to various contexts.

When assessing the overlap between ADHD and OE in the context of gifted learners, it is crucial to consider the diverse psychological characteristics linked to giftedness and the possible displays of ADHD symptoms in this setting. The offered definitions highlighted the intricacy of these constructs and emphasized the necessity for individualized evaluation methods and interferences to foster the different needs of gifted learners with overlapping OE and ADHD qualities. For the utilized tools in the selected studies on OE and ADHD in the gifted context, a variety of methods were highlighted for assessing them. Across the various settings and geographical locations depicted in the selected studies. The OEQ-II emerged as the common diagnostic tool for OE.

The OEQ-II evaluated heightened responsiveness and sensitivity to external and internal triggers. On the other hand, ADHD diagnostic instruments varied broadly across the selected studies, encompassing the Conners Third Edition Self-Report Scale, ADHD-IV Rating Scale, and Conners Third Edition Behavior Rating Scale.

These tools identify the primary symptoms of ADHD, like inattention, hyperactivity, and impulsivity. The dominant use of OEQ0II for assessing OE in different studies emphasized the significance of comprehending gifted learners' special psychological conditions and their possible overlap with ADHD symptoms. The diversity of ADHD diagnostic instruments imitates the complexity of assessing ADHD in gifted individuals and the necessity for individualized evaluations to distinguish between giftedness and ADHD.

Consequently, the present body of research offers perceptive information, but it also highlights the necessity for a focused effort to enhance research processes and instructional methods for gifted children who have ADHD and OE. The current review

sought to enhance the ability to identify, understand, and assist the different challenges of gifted learners through thorough research and multidisciplinary collaboration across both tools, the Mixed Method Appraisal tool and QUADAS-II, that complimented each other throughout the review, leading to more efficient treatments and inclusive academic opportunities.

Recommendations

For the Well-being of Students

Recommendations for future research include longitudinal studies that track the progress of OE and ADHD symptoms in gifted students through time. By tracking down participants from childhood to adulthood, researchers may gain a more inclusive comprehension of how these cases manifest and interrelate between various life periods.

Also, conducting comparative research across various educational and cultural settings can offer perceptions of the cultural specificity versus universality of ADHD and OE in gifted students. By comparing results from different people, researchers may recognize common characteristics and variations in the depiction, evaluation, and influence of these cases.

In addition, future research may emphasize progressing and assessing interventions specifically designed to tackle the needs of gifted students with ADHD and OE. These interferences may involve educational plans, psychoeducational interferences, and behavioral therapy sessions aiming at enhancing academic outcomes, social and emotional well-being, and executive function abilities.

For Practice and Knowledge

In addition to recommendations for future research, the following are plans that could be adopted by teachers, clinicians, and practitioners based on the findings of the present review:

Professionals	Plans
Teachers	Apply designed interventions for gifted learners depicting high levels of overexcitabilities, shedding light on individualized support and improvement activities designed to the learners' specific needs. This allows the improvement of learners' academic experiences and social interactions, indorsing the students' academic success and well-being. For instance, learners with a high intellectual OE, offer chances for independent reading materials or research projects to arouse their intellectual progress.
Clinicians	Offer resources and training for clinicians to precisely evaluate overexcitabilities in gifted learners and separate them from ADHD symptoms, safeguarding appropriate diagnosis and intervention plans. This allows the equipment of clinicians with the skills and knowledge they need which can add to the early recognition and suitable support for gifted learners with OEs, limiting misdiagnosis and fostering positive results. For example, for students with a high-functioning intellectual OE, offer role-playing and case study exercises to practice distinguishing between ADHD symptoms and OE.
Practitioners	Encourage interdisciplinary cooperation between educators, practitioners, and clinicians to produce inclusive support approaches that include academic, social, emotional, and behavioral interferences for gifted learners with OEs. Doing this allows the generating of holistic support plans that tackle the complex needs of gifted learners, improving their potential for personal and academic development. For example, organize frequent meetings to cooperatively plan intervention programs and share the appropriate practices for promoting gifted learners crosswise social, emotional, academic, and behavioral fields.

Limitations

While the study was designed to provide valuable insights and enhance the understanding of this complex interplay, it is crucial to acknowledge certain limitations that may affect the scope and generalizability of its findings. Firstly, this study was restricted by the temporal constraints of the selected literature, covering the years 1990 to 2023. The selected timeframe encompassed a substantial portion of related research. However, the topic was not studied before 1990 because it is a new topic for educators and researchers in the field of gifted education and educational psychology.

Another potential limitation is language and geographic bias. The majority of the included studies are expected to be published in English, which may introduce a bias against non-English publications. Other studies are likely published about the present review's topic in languages other than English. Hence, this language restriction could inadvertently exclude valuable research conducted in different linguistic and cultural contexts.

APPENDIX 1

QUADAS-2 Participant SELECTION

Article	Included Studies	Participant Selection				
		Was a consecutive or random sample of students enrolled?	Was a case-control design avoided?	Did the study avoid inappropriate exclusions?	Could the selection of students have introduced bias?	Are there concerns that the included students do not match the review question?
Dabrowski's Overexcitabilities Profile among Gifted Students	Aliza et al. (2013)	NO	YES	YES	YES	NO
Pay Attention to Inattention: Exploring ADHD Symptoms in a Sample of Underachieving Gifted Students	McCoach et al. (2020)	NO	YES	YES	YES	NO
Overexcitabilities and ADHD in Gifted Adolescents in Jordan: Empirical Evidence	Al-Hroub and Kreyam (2020)	YES	YES	YES	YES	NO
The Relationship Among Giftedness, Gender, and Overexcitability	Buchet et al. (2011)	No	yes	unclear	yes	no
Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective	He, Wu-jing(2017)	NO	YES	YES	YES	No
Greater male variability in overexcitabilities: Domain-specific patterns	He et al. (2014)	NO	YES	YES	YES	NO
Comparing Overexcitability Scores between STEM Talented Students and Generally Gifted Students Using the OEQ-II	Imburgian(2014)	YES	YES	Yes	YES	NO
A Comparison of Dabrowski's Overexcitabilities by Gender for American and Korean High School Gifted Students	Piirto et al. (2008)	NO	YES	YES	YES	NO
Overexcitabilities: A new way to think about talent?	Tiesco et al. (2007)	NO	yes	yes	Yes	NO

Examining Parent and Teacher Perceptions of Behaviors Exhibited by Gifted Students Referred for ADHD Diagnosis Using the Conners 3 (An Exploratory Study)	Wood (2012)	YES	YES	YES	YES	YES
Comparing overexcitabilities of gifted and non-gifted 10 th grade students in Turkey	Guzel & Akarsu (2007)	YES	YES	YES	YES	NO
Emotional Development of Gifted Students: Comparative Study About Overexcitabilities	Sousa & Fleith (2021)	NO	YES	YES	YES	NO
Overexcitabilities and ADHD in the Gifted: An Examination	Rinn & Reynolds (2012)	NO	Yes	YES	YES	NO

APPENDIX 2 QUADAS-2 INDEX TEST

Article	Included Studies	Index Test			
		Were the index test results interpreted without knowledge of the results of the reference standard?	If a threshold was used, was it prespecified?	Could the conduct or interpretation of the index test have introduced bias?	Are there concerns that the index text, its conduct, or its interpretation differ from the review question?
Dabrowski's Overexcitabilities Profile among Gifted Students	Aliza et al. (2013)	unclear	YES	YES	NO
Pay Attention to Inattention: Exploring ADHD Symptoms in a Sample of Underachieving Gifted Students	McCoach et al. (2020)	YES	YES Y	YES	YES
Overexcitabilities and ADHD in Gifted Adolescents in Jordan: Empirical Evidence	Al-Hroub & Krayem .(2020)	unclear	NO	YES	NO
The Relationship Among Giftedness, Gender, and Overexcitability	Buchet et al. (2011)	unclear	NO	yes	No
Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective	He & Wu-jing (2017)	Unclear	YES	YES	No
Greater male variability in overexcitabilities: Domain-specific patterns	He et al. (2014)	No	No	YES	No
Comparing Overexcitability Scores between STEM Talented Students and Generally Gifted Students Using the OEQ-II	Imburgian (2014)	Unclear	No	YES	NO

A Comparison of Dabrowski's Overexcitabilities by Gender for American and Korean High School Gifted Students	Piirto et al., (2008)	NO	NO	YES	NO
Overexcitabilities: A new way to think about talent?	Tiesco et al., (2007)	Unclear	NO	YES	NO
Examining Parent and Teacher Perceptions of Behaviors Exhibited by Gifted Students Referred for ADHD Diagnosis Using the Conners 3 (An Exploratory Study)	Wood (2012)	YES,	NO	YES	YES
Comparing overexcitabilities of gifted and non-gifted 10 th grade students in Turkey	Guzel & Akarsu (2007)	yes	no	yes	no
Emotional Development of Gifted Students: Comparative Study About Overexcitabilities	Sousa & Fleith (2021)	Unclear	NO	YES	NO
Overexcitabilities and ADHD in the Gifted: An Examination	Rinn & Reynolds (2012)	unclear	NO	YES	NO

APPENDIX 3 QUADAS-2 REFERENCE STANDARD

Article	Included Studies	Reference Standard			
		Is the reference standard likely to correctly classify the target condition?	Were the reference standard results interpreted without knowledge of the results of the index test?	Could the reference standard, its conduct, or its interpretation have introduced bias?	Are there concerns that the target condition as defined by the reference standard does not match the review question?
Dabrowski's Overexcitabilities Profile among Gifted Students	Aliza et al. (2013)	YES	NO	YES	NO
Pay Attention to Inattention: Exploring ADHD Symptoms in a Sample of Underachieving Gifted Students	McCoach et al. (2020)	YES	unclear	YES	YES
Overexcitabilities and ADHD in Gifted Adolescents in Jordan: Empirical Evidence	Al-Hroub & Krayem (2020)	YES	unclear	unclear	NO
The Relationship Among Giftedness, Gender, and Overexcitability	Buchet et al. (2011)	Yes	unclear	yes	NO
Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective	He, & Wu-jing (2017)	YES	unclear	YES	NO

Greater male variability in overexcitabilities: Domain-specific patterns	He et al. (2014)	YES	unclear	YES	No
Comparing Overexcitability Scores between STEM Talented Students and Generally Gifted Students Using the OEQ-II	Imburgian (2014)	unclear	unclear	Yes	NO
A Comparison of Dabrowski's Overexcitabilities by Gender for American and Korean High School Gifted Students	Piirto et al (2008)	YES	unclear	YES	NO
Overexcitabilities: A new way to think about talent?	Tiesco et al, (2007)	Unclear	Unclear	YES	NO
Examining Parent and Teacher Perceptions of Behaviors Exhibited by Gifted Students Referred for ADHD Diagnosis Using the Conners 3 (An Exploratory Study)	Wood (2012)	NO	unclear	YES	YES
Comparing overexcitabilities of gifted and non-gifted 10 th grade students in Turkey	Guzel & Akarsu (2007)	yes	unclear	yes	no
Emotional Development of Gifted Students: Comparative Study About Overexcitabilities	Sousa & Fleith (2021)	YES	unclear	yes	no
Overexcitabilities and ADHD in the Gifted: An Examination	Rinn & Reynolds (2012)	YES	unclear	YES	NO

APPENDIX 4 QUADAS-2 FLOW AND TIMING

Article	Included Studies	Flow and Timing				
		Was there an appropriate interval between index tests and reference standards?	Did all students receive a reference standard?	Did all students receive the same reference standard?	Were all students included in the analysis?	Could the student flow have introduced bias?
Dabrowski's Overexcitabilities Profile among Gifted Students	Aliza et al. (2013)	unclear	yes	yes	YES	YES
Pay Attention to Inattention: Exploring ADHD Symptoms in a Sample of Underachieving Gifted Students	McCoach et al. (2020)	unclear	YES	YES	NO	YES
Overexcitabilities and ADHD in Gifted Adolescents in Jordan: Empirical Evidence	Al-Hroub & Kreyem (2020)	unclear	YES	YES	YES	YES
The Relationship Among Giftedness, Gender, and Overexcitability	Buchet et al. (2011)	unclear	Yes	yes	yes	yes
Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective	He et al. (2017)	NO	YES	YES	YES,	YES,

Greater male variability in overexcitabilities: Domain-specific patterns	He et al. (2014)	unclear	YES	YES	YES	YES
Comparing Overexcitability Scores between STEM Talented Students and Generally Gifted Students Using the OEQ-II	Imburgian (2014)	unclear	YES	YES	YES	YES
A Comparison of Dabrowski's Overexcitabilities by Gender for American and Korean High School Gifted Students	Piirto et al (2008)	unclear	YES	YES	YES	yes
Overexcitabilities: A new way to think about talent?	Tiesco et al, (2007)	unclear	YES	YES	YES	YES
Examining Parent and Teacher Perceptions of Behaviors Exhibited by Gifted Students Referred for ADHD Diagnosis Using the Conners 3 (An Exploratory Study)	Wood (2012)	YES	unclear	unclear	YES	YES
Comparing overexcitabilities of gifted and non-gifted 10 th grade students in Turkey	Guzel & Akarsu (2007)	unclear	yes	no	yes	yes
Emotional Development of Gifted Students: Comparative Study About Overexcitabilities	Sousa & Fleith (2021)	unclear	yes	no	yes	yes
Overexcitabilities and ADHD in the Gifted: An Examination	Rinn & Reynolds (2012)	unclear	YES	YES	YES	YES

APPENDIX 5 MMAT GUIDELINES

Part I: Mixed Methods Appraisal Tool (MMAT), version 2018

Category of study designs	Methodological quality criteria	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	S1. Are there clear research questions?				
	S2. Do the collected data allow to address the research questions?				
	<i>Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.</i>				
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?				
	1.2. Are the qualitative data collection methods adequate to address the research question?				
	1.3. Are the findings adequately derived from the data?				
	1.4. Is the interpretation of results sufficiently substantiated by data?				
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?				
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?				
	2.2. Are the groups comparable at baseline?				
	2.3. Are there complete outcome data?				
	2.4. Are outcome assessors blinded to the intervention provided?				
	2.5. Did the participants adhere to the assigned intervention?				
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?				
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?				
	3.3. Are there complete outcome data?				
	3.4. Are the confounders accounted for in the design and analysis?				
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?				
	4.2. Is the sample representative of the target population?				
	4.3. Are the measurements appropriate?				
	4.4. Is the risk of nonresponse bias low?				
	4.5. Is the statistical analysis appropriate to answer the research question?				
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?				
	5.2. Are the different components of the study effectively integrated to answer the research question?				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?				

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