AMERICAN UNIVERSITY OF BEIRUT

THE ROLE OF GENDER, OVEREXCITABILITIES AND ADHD IN PREDICTING CREATIVITY IN LEBANESE HIGHSCHOOL STUDENTS

by
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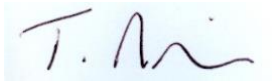
Dr. Tamer Amin, Associate Professor		
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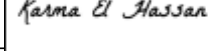
Dr. Karma El Hassan, Associate Professor		
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ABSTRACT

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Title: The Role of Gender, Overexcitabilities and ADHD in Predicting Creativity in Lebanese Highschool Students

The relationship between overexcitabilities (OE) and creativity remains inconclusive based on the few available empirical studies in the literature. Similarly, while some claim that children with attention deficit hyperactivity disorder (ADHD) are more creative than their peers without ADHD, others do not agree with that claim. Furthermore, some researchers believe that the potential to misdiagnose creative children with ADHD exists due to the similarity of the symptoms of ADHD with the behavioral manifestations of OEs that are higher in creative children. Due to the controversy in the literature surrounding those claims, and the paucity of empirical research in Lebanon investigating them, the researcher proposes a study that aims to examine (a) the role of gender, OEs, and ADHD in the prediction of domain-specific creativity among Lebanese high-school students attending private schools in Saida; (b) the relationship between OEs and ADHD types in the same sample; and (c) the gender differences in the levels of OEs and ADHD among the students. Students (N=240) from private schools participated in this study. The Conners 3rd Edition Self-Report Scale was used to measure ADHD. The Overexcitability Questionnaire II was used to measure OEs and the Kaufman Domains of Creativity Scales (KDOCS) was used to measure creativity. Hierarchical multiple regression revealed that gender is a notable predictor of artistic creativity in favor of girls and inattention is a notable negative predictor of everyday creativity. It also revealed that the OEs are generally a notable predictor of creativity with intellectual OE being the most notable predictor of everyday, scientific and scholarly creativity and sensual OE being the most notable predictor of performance and artistic creativity. A canonical correlation analysis showed that OEs and ADHD share 47% of the variance and the results are similar by gender. An independent t-test showed that boys and girls did not differ on ADHD subscales. It also showed that girls had higher emotional and sensual OEs while boys had higher psychomotor OEs. The results were discussed in light of the strengths and limitations of this study and recommendations for future research were made.

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CHAPTER 1

INTRODUCTION

Creativity is considered to be an important human characteristic that lies at the core of human development and innovation (Haase et al., 2018). Even though it's such an important trait, it is one of the least understood psychological constructs, particularly in the absence of an explicit definition (Makel & Plucker, 2008). The most recent consensus is that novelty and usefulness are at the core of creativity (Haase et al., 2018). Researchers have long observed that highly creative children often display behavioral and conduct problems theorized to stem from repressed needs (Abraham et al., 2006). Daniels and Piechowski (2010) have claimed that highly creative children may even be misdiagnosed as having attention deficit hyperactivity disorder (ADHD). These claims are largely theoretical stemming from descriptions of creative people (Healy & Rucklidge, 2005a).

One way misdiagnosis occurs is when certain behaviors are labeled with a mental health disorder or a learning disability when in fact the behavior can be better explained differently (Webb et al., 2016). In general, the reason children are most commonly referred to health care professionals is for an evaluation of ADHD (Webb et al., 2016). Such a diagnosis puts the child in a position where every action becomes evidence of the diagnosis, and their behaviors are viewed as problematic and in need of a solution or cure (Stearns, 2015).

Several researchers in the field of education believe that the potential of misdiagnosis exists particularly due to the overlap between ADHD symptoms and characteristics of creative individuals (Aliabadi et al., 2016; Flint, 2001). Such behaviors expressed in high activity levels,

inattentiveness, impulsivity, oversensitivity, and others (Aliabadi et al., 2016) may lead to a referral for ADHD evaluation. Even though the behaviors share similar topographies, they serve different functions and typically do not manifest in all settings for a creative child (Hartnett et al., 2004; Lee & Olenchak, 2015). Some researchers view creativity as a potentially positive outcome of ADHD (Abraham et al., 2016; Ten et al., 2020). They believe that characteristics such as ease of distractibility and frequent task switching may positively contribute to creative production (Ten et al., 2020).

Overexcitabilities (OEs), a concept borrowed from Dabrowski's theory of positive disintegration, can potentially explain ADHD-like behaviors in creative children (Flint, 2001). Dabrowski (1967) described the OEs as extended long-lasting disproportional reactions to internal and external stimuli. This heightened sensitivity is believed to be innate and can be expressed in several forms: psychomotor, sensual, intellectual, imaginational, and emotional (Dabrowski, 1967). Even though Dabrowski's theory was not initially a theory for the creative and gifted (Ackerman, 1997), it evolved from his work with gifted and creative individuals under conditions of extreme stress (Piechowski, 1979). He studied the development of gifted youth whether intellectual, creative or artistic (Daniels & Piechowski, 2010). Based on his work, he viewed a relationship between imaginational OEs and artistic creativity, and that between the conjunction of intellectual, imaginational, and emotional OEs and scholarly creativity (Nixon, 2014). According to Dabrowski, the five forms of OEs could contribute to creativity but a vital role is played by intellectual, imaginational, and emotional OEs (He et al., 2017).

While ADHD carries a negative connotation (Stearns, 2015), the OEs are viewed as a fundamental attribute of the creative personality and as a potential for advanced development (Daniels & Piechowski, 2010). This study aims to shed the light on the relationship between the

two constructs of OEs and ADHD, and the role of each in predicting the creativity domains among high school students in Lebanon.

Purpose of the Study

The first purpose of this study is to examine the role of gender, OEs, and ADHD in the prediction of creativity domains among Lebanese high school students. The researcher will examine the role of demographics, three subscales of ADHD (inattentive, hyperactive-impulsive, Conners ADHD index), and five forms of OEs (intellectual, imaginational, emotional, sensual, and psychomotor) in predicting five creativity domains (self/everyday, scholarly, performance, mechanical/scientific and artistic). Another purpose is to examine the relationship between the OEs and ADHD subscales in the same sample. The third purpose is to examine the gender differences in the levels of OEs and ADHD among Lebanese high-school students.

Research Questions

The research questions guiding this study are the following:

- What are the roles of Lebanese high-school students' gender, five forms of OEs, and three subscales of ADHD in predicting five domains of creativity?
- What is the relationship between the five forms of OEs and ADHD scales among Lebanese high-school students?
- What are the gender differences in OE and ADHD levels among Lebanese high-school students?

Rationale

A fair number of studies have found significantly higher OEs in gifted and creative children (Harrison & Haneghan, 2011; Schiever, 1985; Siu, 2010; Yakamci-Guzel & Akarsu,

2006), and some researchers have claimed that high levels of OEs can be used as a supplementary identification method of gifted or creative students (Ackerman, 1997; Bouchard, 2004; Breard, 1995; Piechowski, 1979). However, He et al. (2017) claimed that the creativity-OE relationship remains inconclusive based on the few available comparative empirical studies. Their correlational study does provide empirical evidence for the power of OEs in predicting creativity, yet further research investigating this relationship is encouraged (He et al., 2017).

Similarly, the relationship between ADHD and creativity is controversial. While some found that children with ADHD exhibit better divergent thinking (Abraham et al., 2006; Ten et al., 2020), others questioned this assertion (Aliabadi et al., 2016; Healey & Rucklidge, 2005). The inconclusiveness of the creativity-OE relationship and paucity in the research investigating the power of OEs in predicting domain-specific creativity along with disagreement about the relationship between ADHD and creativity in children motivate the first purpose of this study.

Furthermore, given the claim that OEs are a source of misdiagnosis of gifted and creative children as having ADHD (Al-Hroub & Krayem, 2020; Hartnett et al., 2004; Lee & Olenchak, 2015; Mullet & Rinn, 2015; Rinn & Reynolds, 2012; Webb et al., 2016), and the little empirical evidence investigating the relationship between ADHD and OEs (Al-Hroub & Krayem, 2020; Rinn & Reynolds, 2012), investigating the overlap between the two constructs is justifiable. This can be further argued given that some researchers believe that Dabrowski was describing behavioral characteristics of ADHD in explaining psychomotor OE without referring to the term due to its non-existence at the time (Mika, 2006; Nelson et al., 2006). Noteworthy to say is that these researchers hold opposing views on whether there is empirical evidence supporting the idea of the misdiagnosis of gifted children with ADHD. Additionally, the few studies that do investigate the overlap between OEs and ADHD, do so with gifted samples exclusively (Al-

Hroub & Krayem, 2020; Rinn & Reynolds, 2012), and thus an investigation of the overlap between the two constructs in the general classroom is warranted (Rinn & Reynolds, 2012). Given that gender differences are also worthy of exploration in individuals with ADHD (Berri & Al-Hroub, 2016), and have been a matter of disagreement in studies investigating OEs (Bouchet & Falk, 2001; Gallagher, 1985; Siu, 2010), the third purpose of this study is justified.

Consistent with the literature, Berri, and Al-Hroub (2016) report those students in Lebanon are often referred for ADHD evaluation resulting in misdiagnosis. No empirical studies investigated the relationship between ADHD and OEs in Lebanese high-school students. Additionally, no studies investigated the role of gender, OEs, and ADHD in predicting domain-specific creativity among Lebanese high-school students. The choice of the population as that of students attending private schools in the District of Saida is justified based on the researcher's resources. The choice of high-school students is justified based on the self-reporting nature of the tools to be used in this study.

Significance

Failure to properly identify exceptional children has been shown to lead to emotional and behavioral problems (Al-Hroub & Krayem, 2020; Lee & Olenchak, 2015), and early identification paves the way for a successful future (Lee & Olenchak, 2015). That is why it is important to investigate the relationship between OEs and ADHD in an attempt to extend researchers' efforts in determining whether a significant overlap exists between the two constructs. If researchers consistently find a significant overlap between the two constructs, it may be worth it for decision-makers to consider emphasizing Dabrowski's theory in teacher and counselor training programs. When teachers view the expression of OEs as signs of pathology, particularly ADHD, the negative label becomes the lens through which all behavior is interpreted

and according to which inappropriate treatment is given (Hartnett et al., 2004). In practice, completely quieting children's expression of OEs can damage rather than enhance their creative and overall development (Daniels & Piechowski, 2010). Additionally, confounding creativity and ADHD may lead to maladapted teaching and unnecessary medication (Healey & Rucklidge, 2006a). Daniels and Piechowski (2010) suggest that teachers should integrate the intensity of OEs with the daily confines of the classroom and help children modulate the expression of this intensity based on the circumstances. The literature is condensed with a focus on the deficits, negative behaviors, and educational implications of students with ADHD with less focus on their ability, creativity, and talents (Leroux & Levitt-Perlman, 2000). This study extends the existing research on the relationship between OEs and ADHD to creativity by studying this relationship using a domain-specific perspective of creativity among Lebanese high-school students.

CHAPTER 2

LITERATURE REVIEW

This chapter provides an overview of the theoretical framework adopted in this study for the conception of creativity, attention deficit hyperactivity disorder, and overexcitabilities from Dabrowski's Theory of Positive Disintegration. It also provides a review of the literature on studies concerning the relationship between Dabrowski's overexcitabilities and creativity, overexcitabilities and ADHD, and creativity and ADHD.

Creativity

Even though the construct of creativity is one of the least understood constructs in psychology, one can argue that it is one of the most important psychological constructs (Makel & Plucker, 2008). One of the reasons research on creativity is conflicting is the absence of an explicit definition (Makel & Plucker, 2008). One definition of creativity that seems to be accepted in the field is the ability to produce solutions, behaviors, or insights that are not only unique but also adaptive (Baer & Kaufman, 2005; Kaufman et al., 2009).

The Amusement Park Theoretical Model of Creativity

One contentious area in the field of creativity is whether creativity is domain-general or domain-specific (Baer & Kaufman, 2005; Makel & Plucker, 2008). Researchers do not agree on whether a creative person exhibits creativity in numerous domains or a particular domain (Makel & Plucker, 2008), yet researchers from the contrasting camps acknowledge merit from the other point of view (Baer & Kaufman, 2005). Makel and Plucker (2008) claim that the dominant view is that of domain-specific creativity while yet acknowledging research supporting both extremes.

Ultimately, the answer to the question is far from simple, particularly since such an answer would require an understanding of what constitutes a domain and there is no current consensus on exactly what domain-specificity means (Sternberg, 2009).

The Amusement Park Theory (APT) is the first model to bridge between the domain-general and the domain-specific views of creativity (Baer & Kaufman, 2005). It is a hierarchal model that supposes domain-general initial requirements of creativity and then moves towards more domain-specificity (Kaufman, 2012). Baer and Kaufman (2005) explain the APT model of creativity by making analogies to amusement parks. They believe that there are initial requirements for creativity, much like there are requirements at Disney World of being a certain height to go on a ride (Baer & Kaufman, 2005). These initial requirements are intelligence, motivation, and a suitable environment (Baer & Kaufman, 2005). They are necessary but not sufficient (Baer & Kaufman, 2005). Without them, creative performance is unlikely to occur (Baer & Kaufman, 2005). When it comes to intelligence, Baer and Kaufman (2005) believe that a minimal level of intelligence, defined as "g" or crystalized-fluid intelligence is needed for creativity, with that level varying across domains. For example, mathematical creativity requires a higher minimum level of intelligence than artistic creativity. When it comes to motivation, Baer and Kaufman (2005) conceptualize it as motivation in the general sense: having the desire to do something, regardless of whether this motivation is intrinsic or extrinsic, and with the acknowledgment that motivation is, unlike intelligence, varying. Similarly, the environment is referred to in a general way as an environment that either encourages creativity or discourages or even punishes it (Baer & Kaufman). Also, much like a person chooses to go to different thematic areas like the water park or the zoo, there are general thematic areas with an underlying unity in which someone can be creative like science or arts (Baer & Kaufman, 2005). While Baer and

Kaufman's (2005) factor analysis yielded three areas: empathy/communication, hands-on creativity, and math/science creativity, different factor analyses yielded slightly different factor structures and thus more research is needed to clearly identify them. In the next level comes more specific domains within the general domain such as the domain of dance in the domain of arts. Baer and Kaufman (2005) compare that to choosing a particular park from the type of parks a person wants to go to. At this level, motivation, knowledge, personality traits, environment, and opportunity play an important role. For example, one's motivation to write may be strong for poetry but weaker for journalism. Similarly, while the physical and biological sciences fall under the same general theme of science, different knowledge is needed in each domain for creative production – with modest overlap. Likewise, some personality traits may be important in one field but not in another and opportunities may be more readily available for certain creative work (writing poems) than for another (playing the violin). The environment may bring forth the less readily available opportunity for example when a child's parents can afford violin lessons. Finally, in the last level, there are micro-domains associated with specific tasks in the domain (Baer & Kaufman, 2005). Baer and Kaufman (2005) compare that to a particular ride in an amusement park.

The 4C Model of Creativity

For a long time, creativity researchers made the distinction between two types of creativity only, Big-C and little-c creativity (Kaufman & Beghetto, 2009; Makel & Plucker, 2008). Big-C creativity is concerned with the creative achievements of eminent persons while little-c is concerned with the creative achievements of everyday individuals (Kaufman & Beghetto, 2009). In conducting research with student populations, researchers focus on the study

of little-c creativity (Kaufman & Beghetto, 2009). Beghetto and Kaufman (2007) first introduced the concept of mini-c as a little-c under the little-c. They argued that little-c lumps together the creative school student who produces excellent works of art for their art class with the more accomplished yet not eminent artist. They called for the need to distinguish between the two (Beghetto & Kaufman, 2007). Kaufman and Beghetto (2009) also realized a need to distinguish between the adolescent who plays Jazz at birthday and wedding parties and the professional jazz player. Thus, they proposed the 4C model with the following components: mini-c, little-c, Pro-C, and Big-C (Kaufman & Beghetto, 2009). That way, the model can take into account the gradation of creativity and gaps between little-c and Big-C and allow the researcher to determine the magnitude of creativity (Kaufman & Beghetto, 2009).

Beghetto and Kaufman (2007) defined mini-c as a "novel and personally meaningful interpretation of experiences, actions, and events" (p. 1). Creativity at this level encompasses the new insights students make as they learn new things, even if the insights are not particularly new to the field (Beghetto & Kaufman, 2007), and even when the student can't verbally express them (Kaufman & Beghetto, 2009). This definition of mini-c allows the acknowledgment of the creative potential of many individuals that would have otherwise been overshadowed by the creative accomplishments of a few (Kaufman & Beghetto, 2009). On the other hand, Pro-C is creativity that surpasses little-c but has not reached Big-C (Kaufman & Beghetto, 2009). Pro-C is reserved for people who produce creative work at professional levels, regardless of whether or not they make a living out of it (Kaufman & Beghetto, 2009). An example of the expression of mini-c would be that of a child describing their idea of a "mushroom princess" (Beghetto & Kaufman, 2007). An example of the expression of little-c would be that of an individual mixing ingredients from different cuisines to make a tasty dish at home (Kaufman & Beghetto, 2009).

Alternatively, a professional chef who earns living assembling creative entrees would fit into the Pro-C category (Kaufman & Baghetto, 2009). Only when those contributions revolutionize the field, then the individual would fulfill the requirement of Big-C creativity (Kaufman & Beghetto, 2009). According to this model, everyday creativity can fit anywhere between mini-c and Pro-C (Kaufman & Beghetto, 2009).

This proposed model represents a trajectory of creativity in an individual's life that can be described as developmental (Kaufman & Beghetto, 2009). Typically, everyone starts in mini-c and gradually transitions through the stages but a rare few can make the direct jump from mini-c to Pro-C either through a formal apprenticeship or through non-structured exploration that requires around 10 years in either case (Kaufman & Beghetto, 2009). Similarly, people usually move from little-c to Pro-C by working with a more expert but some people actively decide to stay in the vicinity of little-c (Kaufman & Beghetto, 2009). People who are in Pro-C either remain in that category for the rest of their lives, with or without further contribution after they reach the pinnacle of their work, and only time will tell whether they will be considered in the Big-C category (Kaufman & Beghetto, 2009). Even in the Big-C category, only a selected few rise to the level of what would be considered a Legend, like Einstein or Newton (Kaufman & Beghetto, 2009).

The 4C model is compatible with the Amusement Park Theoretical Model of creativity (Kaufman & Beghetto, 2009). The domain-general requirements of intelligence, motivation, and environment are essential for all types of creativity, however, as the individual ascends in the magnitude of their creativity, this creativity becomes more specific (Kaufman & Beghetto, 2009). In other words, it is very possible that someone can possess mini-c or little-c creativity in several

domains but it is very unlikely for a person to achieve Big-C or even Pro-C creativity status in multiple domains (Kaufman & Beghetto, 2009).

Tools to Measure Creativity

Several tools are used in the literature as a measure of creativity. Haase et al. (2018) classify these tools into two categories: (a) performance-based measures in which the participant is asked to perform a task that can be figural or verbal like the Torrance Test of Creative Thinking (TTCT), Test of Creative Thinking Drawing Production (TCT-DP), and Rebus Test and (b) rating scales in which a person is rated by other informants or more commonly themselves on an item scale such as Creative Behavior Index, Creative Activity Questionnaire, and the Short Scale for Creative Self. Self-assessment is almost always a researcher's second choice (Kaufman, 2019) since the strength of the relationship between creative self-efficacy and performance-based measures is not clear (Haase et al., 2018). Nevertheless, such tools have been used in almost 40% of publications on creativity since they are often free, quick to administer, and easy to score (Kaufman, 2019). They can serve as a limited proxy for performance-based measures (Kaufman, 2019).

Attention Deficit Hyperactivity Disorder (ADHD)

ADHD is a disorder characterized by patterns of inattention and/or hyperactivity and impulsivity that appear before the age of 12 and manifest across several settings (American Psychiatric Association, 2013). According to the *Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition* (DSM-V; American Psychiatric Association, 2013), an individual can be diagnosed with one of three presentations of ADHD: predominantly hyperactive-impulsive presentation, predominantly inattentive presentation, and a combined presentation. Some

examples of symptoms of inattention as stated in the *DSM-V* are failure to pay attention to details, difficulty in organizing tasks and activities, frequent loss of belongings, and forgetfulness. Some examples of symptoms of hyperactivity and impulsivity are fidgeting, squirming in a seat, running around in inappropriate situations, talking excessively, interrupting, and experiencing difficulty in waiting for a turn (APA, 2013). The reason children are most commonly referred to health care professionals is for ADHD evaluation (Webb et al., 2016).

Tools to Assess ADHD

ADHD is typically diagnosed by psychologists or clinicians who stress the importance of the role parents and teachers play in the diagnostic process (El-Khoury & Al-Hroub, 2018). Several ways are practiced to identify and diagnose ADHD such as behavioral checklists, specific assessments that measure attention and memory, or a series of assessments including intelligence testing (Lee & Olenchak, 2015), though Webb et al. (2016) claim that intelligence testing is not routinely included in ADHD assessment while behavioral checklists are the most commonly relied on. The diversity in the assessment methods of diagnosing ADHD reflects the differences in operationalizing and defining ADHD by different professionals (Lee & Olenchak, 2015). It follows that the prevalence among the general population ranges from 3% to 11% depending on the diagnostic criteria used (Lee & Olenchak, 2015; Webb et al., 2016).

The most commonly used tools to assess ADHD are rating scales completed by the parents and/or the teachers of the child (Murlaney et al., 2022). Even though such tools pose a risk of high false positives, which in turn increases the burden on the healthcare system, they are useful as they are easy to administer, can be administered to large populations, and do not require clinical interpretations (Murlaney et al., 2022). Examples of such rating scales are the Vanderbilt

Assessment Scales, Conners Comprehensive Behavior Ratings Scales, Conners 3rd edition Rating Scales for ADHD, and the Child Behavior Checklist (Webb et al., 2016). Such tools often restate the symptoms outlined in the DSM-V (Webb et al., 2016) and the presence or absence of ADHD is determined by meeting a symptom threshold (Murlaney et al., 2022). Typically, the informant completes such scales by choosing ratings about items ranging from never to always (Webb et al., 2016). These choices are assigned points, which in turn add up to subscales regarding attention, activity level, impulsivity, depression, and anxiety (Webb et al., 2016). It is important to note that none of these tools is a neurological test and proper assessment of ADHD requires extensive clinical evaluation in which such screening tools are combined with other measures like those of intelligence, achievement, emotional status, and executive function (Webb et al., 2022) as there have been raising concerns regarding the under-recognition and misdiagnosis of ADHD (Murlaney et al., 2022).

Gender Differences in ADHD

The topic of gender differences in ADHD has received significant attention from researchers over the years. Generally, researchers have found that boys are more likely than girls to get a referral, treatment, and diagnosis for ADHD (Slobodin & Davidovitch, 2019). Mowlem et al (2019) have confirmed this in a large-scale study including 19,804 children. The estimate is that there are around 2-9 boys for every 1 girl diagnosed with ADHD (Quinn & Madhoo, 2014). Whether such a gender difference truly exists remains up for debate. Some researchers believe that there is an explanation behind these differences (Young et al., 2020). One common hypothesis is that, because inattentiveness is more prominent in girls than boys, their presentation is just at the "subthreshold" for identification (Quinn & Madhoo, 2014). Mowlem et al (2019)

have found that hyperactivity is more likely than inattention to result in a diagnosis, arguably due to the disruptive nature of one behavior versus the other. This hypothesis has also been confirmed in studies that show that teachers are more likely to refer boys to ADHD evaluation (Groenwewald & Sayal, 2009) and that they believe that being inattentive in girls is normal as they view girls as "quiet" and "dreamy" (Berri & Al-Hroub, 2016). Other explanations are that girls are better at developing coping strategies and masking their symptoms or that their symptoms are mistaken for other diagnoses such as anxiety or depression (Quinn & Madhoo, 2014). The specific symptom profile of girls and women with ADHD needs to be better developed so that this group of the population is better served (Quinn & Madhoo, 2014).

Theory of Positive Disintegration

Dabrowski's theory of positive disintegration was not initially a theory of giftedness and creativity (Ackerman, 1997), however, it has been used by researchers in the field of education to understand various aspects of giftedness and creative talent (Mendaglio & Tillier, 2006). It originated from his personal experience, the study of the biographies of several eminent individuals, and clinical studies with artists, actors, dancers, and intellectually and creatively gifted children and youth (Silverman, 2000). He postulated that human development is a five-level hierarchy with self-interest being at the bottom and attainment of the personality ideal being at the top (Silverman, 2000). He used the term personality ideal to describe an individual who has fully developed (Dabrowski, 1967) thus resolving inner conflict and attaining compassion, integrity, and altruism (Silverman, 2000). Theoretically, the developmental potential is predicted by the strength of what Dabrowski called overexcitabilities (OE), combined with talents and special abilities (Piechowski, 1979).

Darowski discovered the OEs prior to the formation of his theory by observing children under conditions that evoked stress (Piechowski, 1979). He described the OEs as extended long-lasting disproportional reactions to internal and external stimuli (Dabrowski). This heightened sensitivity is believed to be innate and can be expressed in several forms: psychomotor, sensual, intellectual, imaginational, and emotional (Dabrowski, 1967). It was initially termed "superstimulatibility" in Polish and later came to be known as overexcitability (Silverman, 2000). The term was chosen to convey the intensity of these reactions that extended beyond what would be expected under the given circumstances (Piechowski, 1979). The OEs manifested in five modes that one can think of as channels of perception through which the individual experiences the world that are independent of one another (Piechowski, 1979). The five forms of OEs are intellectual, imaginational, emotional, sensual, and psychomotor (Piechowski, 1979). Psychomotor OE is expressed in excessive energy, relentlessness, and a love for movement. It can also be expressed in compulsive talking and impulsive action. Sensual OE can be expressed in heightened sensual and aesthetic pleasures. It can also be expressed in overindulgences such as overeating, sexual overindulgence, or shopping sprees. Intellectual OE can be expressed in probing questions, curiosity, desire to learn, problem-solving and theoretical thinking. Imaginational OE can be expressed in the free play of imagination such as daydreaming, animistic thinking, and fantasizing. Emotional OE is the one with the most forms of expression. It can be expressed in the intensity of feelings towards self and others, somatic expression, and strong affective memory among others (Flint, 2001; Mendaglio & Tillier, 2006; Piechowski, 1979). Dabrowski (1967) observed that none of the OEs develops in isolation but rather these OEs coexist with the predominance of one or several forms. These OEs are characterized by either actual or prospective properties that are valuable; OEs carry a positive connotation and are

seen to contribute to psychological development (Dabrowski, 1967). Particularly, these heightened experiences lead to disequilibrium, such that when intellectual OE, imaginational OE, and emotional OE surpass sensual OE and psychomotor OE, greater potential to attain personality development is achieved (Silverman, 2000).

Tools to Measure OEs

Over the years, researchers have used various ways to assess overexcitabilities such as the assessment of open-ended responses to verbal stimuli or autobiographical material (Dabrowski & Piechowksi, 1975; Piechowski, 1975). The development of the Overexcitability Questionnaire (OEQ) in 1983 by Lysy and Piechowski (1983) based on such earlier measures led to further developments in the field. The OEQ was a 21-open-ended questionnaire that aimed to provoke thoughts about specific OEs (Carman, 2011). Ackerman (1997) critiqued the tool claiming it tended to elicit thoughts relevant to the strongest OEs that the individual possesses, yielded scores correlated to the word count such that longer responses resulted in higher scores, and required time to train, administer and score. The OEQ was typically scored by two independent raters who followed up with a consensus scoring procedure to arrive at a final score (Bouchet & Falk, 2001). The OEQ limited researchers' ability to conduct large-scale studies. The overexcitability questionnaire – two (OEQII) was then created by Falk et al. (1999) to pave the way for large-scale projects. The researchers collaborated with prominent researchers who studied overexcitabilities and consulted their published and unpublished works in addition to reviewing responses from over 300 open-ended OEQ questionnaires (Falk et al., 1999). Initially, 140 Likert-scale items were created which were then reduced to 124 after initial revision. Upon testing with a sample of 887 subjects, a 5-factor simple structure that was conceptually and

theoretically relevant emerged constituting 10 items each. Each of the factors could be easily named by one of the overexcitabilities. The tool proved to be highly reliable with a Cronbach alpha above 0.80 for each of the subscales. Scales based on the OEQII have been later constructed like the Me Scale and the Me Scale II that are being used in Taiwan.

Gender Differences in Overexcitabilities

The relationship between overexcitabilities and gender has been receiving attention since the early days of research on the Dabrwoskian theory (Gallagher, 1985; Miller at al., 1994; Piechowski and Miller, 1995). Studies on this relationship are numerous, with some examining gifted populations (Gross et al., 2007), others examining average ability populations (Yakmaci-Guzel & Akarsu, 2006), and others looking at both groups (Siu, 2010). In this section of the literature review, the focus will be on summarizing the results of studies investigating the relationship between gender and overexcitabilities in children and adolescents in the past 20 years.

The most consistent finding is that females score higher than males on emotional and sensual OEs (Siu, 2010; Tieso, 2007a, b; Van den Broeck et al., 2014), sometimes on emotional OE alone (He et al., 2014), and sometimes additionally with imaginational OE (Gross et al., 2007). As for males, they consistently score higher on either intellectual OE (Siu, 2010; Tieso, 2007b) or psychomotor OE (Tieso, 2007a), or both (Van den Broeck et al., 2014). One of the reviewed studies shows no gender differences in all of the OE variables (Yakmaci-Guzel & Akarsu, 2006).

Van den Broeck et al. (2014) compared 363 adolescent girls between the ages of 11 and 15 to 278 boys. Girls scored higher on emotional and sensual OEs while boys scored higher on

intellectual and psychomotor OEs. Siu (2010) compared the OE scores of boys and girls in a sample of 446 Chinese children. The researcher found that females scored higher on emotional and sensual OEs while males scored higher on intellectual OE. Tieso (2007a) found that a group of 263 school-aged females scored higher than their 217 male counterparts on sensual and emotional OEs while males scored higher on psychomotor OE. In a different study by the same researcher, Tieso (2007b) found consistent results for superior female OEs but the males in this sample of 143 school-aged children scored higher than females on intellectual OE rather than psychomotor. He et al. (2014) found similar patterns in a group of 836 middle school students with the exception that females only scored higher on emotional OE. In a sample of 248 adolescents, Gross et al. (2007) found that males did not score significantly higher on any of the OE subscales, but females scored higher on emotional, sensual, and imaginational OEs. Inconsistent with the general findings of the literature, Yakmaci-Guzel and Akarsu (2006) found no gender differences in OE subscales in a sample of 711 adolescents.

Overexcitabilities and Creativity

The research on OEs and talent extends back to the seventies. Piechowski (1975) led the work with a landmark study that empirically supported the theory and paved the way for future quantitative investigations. With the development of the OEQ by Piechowski (1979) and subsequent refinement by Lysy and Piechowski (1983), researchers were able to empirically investigate the relationship between OEs and talent. While most work was done with smaller samples due to the tediousness of scoring the Overexcitability Questionnaire, larger samples became possible with the development of the Overexcitability Questionnaire II (Bouchet & Falk, 2001).

The early period of investigating the relationship between talent and OEs can be described as a period of collaboration between prominent researchers in the field leading to trends that suggested that intellectual OE, imaginational OE, and emotional OE are higher in the gifted and talented (Gallagher, 1985; Piechowski & Colangelo, 1984; Piechowski et al., 1985; Silverman & Ellsworth, 1981). Those came to be known as the Big Three (Mendaglio & Tillier, 2006). Research results also suggested that imaginational OE and emotional OE are higher for the artistically gifted and creative in comparison with intellectually or academically gifted individuals (Piechowski & Colangelo, 1984; Piechowski & Cunningham, 1985; Piechowski et al., 1985). While several of the studies above confounded intellectual giftedness and creativity (Breard, 1995; Silverman & Ellsworth, 1981), others did make the distinction comparing creative or artistically gifted participants in separate samples (Gallagher, 1985; Piechowski & Colangelo, 1984; Piechowski et al., 1985). The focus of this literature review will be on such studies attempting to shed the light on the relationships between OEs and creativity.

The research on the OE-creativity relationship can be grouped as such: comparative studies comparing the levels of OEs of creative individuals to intellectually gifted individuals (Piechwoski & Colangelo, 1984; Piechowski & Cunningham, 1985), comparative studies comparing the level of OEs of high creative to low creative individuals who are in both cases also intellectually gifted (Piirto et al., 2016; Schiever, 1985), comparative studies comparing creative individuals to a control group from the general population on their OEs (Yakamci-Guzel & Akarsu, 2006) and correlational studies showing the contribution of OEs to creativity (He et al., 2017). The research indicates that generally, creative individuals score higher on imaginational and emotional OEs (Martowska et al., 2018; Moon & Montgomery, 2005; Piechowski &

Colangelo, 1984; Piechowski et al., 1985; Piirto et al., 1996; Schiever, 1985; Yakamci-Guzel & Akarsu, 2006). Some studies show that they also score higher on sensual (Martowska et al., 2018; Moon & Montgomery, 2005; Piirto et al., 1996; Yakamci-Guzel & Akarsu, 2006), psychomotor (Gallagher, 1985; Martowska et al., 2018; Moon & Montgomery, 2005; Yakamci-Guzel & Akarsu, 2006), and intellectual OEs (Schiever 1985; Yakamci-Guzel & Akarsu, 2006).

Piechowski and Colangelo (1984) found that artists and intellectually gifted adults scored similarly on intellectual OE but the artists had significantly higher imaginational OE and emotional OE than the intellectually gifted and non-gifted groups. Piechowski and Cunningham (1985) compared the OE profiles of 13 artists to those of 31 intellectually gifted adults from a previous study by Silverman and Ellsworth (1981). They also found that both groups scored similarly on intellectual OE but the artists scored higher on emotional OE and imaginational OE (Piechowski and Cunningham, 1985). Piechowski et al. (1985) concluded that while intellectual OE, imaginational OE, and emotional OE are indicative of intellectual talent, imaginational OE and emotional OE are indicative of artistic talent.

Schiever (1985) found similar trends when comparing a total of 21 highly creative and lower creative 7^{th} and 8^{th} grade intellectually/academically gifted students with the exception that intellectual OE was also higher in the group considered as highly creative. In combining the sample of intellectually/academically gifted and non-gifted used in Ackerman's (1997) sample with 23 artistically but also academically gifted students, Piirto et al. (1996) found similar intellectual OE levels in both gifted groups, and higher imaginational OE, emotional OE, and sensual OE levels in the artistically gifted group. Different from the above, Gallagher (1985)

found that highly creative students had significantly higher imaginational OE and psychomotor OE than low creative students.

Moon and Montgomery (2005) compared the OE profiles of 341 Korean Highschool students enrolled in domain-specific high schools. The researchers found that the art high school students scored higher than the other groups on psychomotor, sensual, imaginational, and emotional OEs. Yakmaci-Guzel and Akarsu (2006) conducted a study to investigate differences in OEs of 10th-grade students in Turkey on basis of intellectual ability, creativity, leadership, and motivation. All OEs were higher in the highly creative group. In a study by Martowska et al (2018), 40 actors with a mean age of 35.48 years old scored higher on sensual, imaginational, emotional, and psychomotor OE than a 30-person control group in Poland. In a different study by Martowska et al (2020), the researchers found that emotional and sensual OEs were twice as higher in a group of 106 musicians compared to a similar size control group. Female musicians scored significantly higher than their control counterparts on sensual, imaginational, and intellectual OEs while male musicians outscored their control counterparts on sensual and emotional OEs and showed lower psychomotor OEs.

In a large-scale study in Honk Kong, He et al. (2017) found that the five forms of OEs together explain 18.6% of the variance in the scores of 1055 students between the ages of 12 and 16 on the Torrance Tests of Creative Thinking – Drawing Production (TTCT-DP). Additionally, the researchers found that imaginational OE was the most significant predictor of creativity. The OEQII could identify the highly creative students with 71.8% accuracy. Miller and Neumister (2012) also found that intellectual OE is a positive predictor of creativity in a study with 323

undergraduate university students where creativity was measured using the Scale of Creative Attributes and Behaviors (SCAB).

The relationship between OEs and creativity has also started to receive attention in the Arab World. In a research study done in Jordan, Al-Shayab and Al-Khatib (2015) found that all overexcitabilities significantly correlate with each of the creativity subscales and the total scale on the TTCT in a group of 336 gifted and average middle school students. Al Suleiman (2014) found a statistically significant correlation between sensual OEs and creative abilities in a sample of 310 female university students.

To the researcher's knowledge, there is no meta-analysis to summarize findings and clarify the relationship between creativity and OEs. The literature seems to show mixed results in terms of what specific OEs are higher in creative individuals (He et al., 2017), which specific OEs correlate to creativity, and what the contribution of individual OEs to creativity is. Dabrowski's hypothesis regarding the contribution of OEs to creativity remains inconclusive (He et al., 2017).

Overexcitabilities and ADHD

When one compares OEs in gifted and creative children to symptoms of ADHD, one can see how the similarity could lead to misdiagnosis (Hartnett et al., 2004; Lee & Olenchak, 2015; Mullet & Rinn, 2015; Webb et al., 2016). Psychomotor OEs in a creative child can be mistaken for hyperactivity characterizing ADHD (Flint, 2001). Imaginational scenarios running through the mind of a creative child may be mislabelled as inattention (Flint, 2001). Emotional intensity as an expression of emotional overexcitability in a creative child may be viewed as the emotional over-reactivity of children who have ADHD (Flint, 2001). Sensual OEs that a creative

child may manifest by looking at and admiring the shape of a flower may be interpreted as distractibility (Flint, 2001). An intellectually overexcitable child who may be pondering about moral dilemmas in his mind may appear inattentive to the outside observer (Flint, 2001). The overlap in symptomatology is the main factor that complicates the empirical investigation of gifted and talented students with ADHD (Foley-Nicpon et al., 2011). Notable to mention is the fact that the DSM-V omitted a statement declaring that classroom inattention may be attributed to boredom resulting from an intellectually stimulating environment for a child with high intelligence (Mullet & Rinn, 2015).

Rinn and Reynolds (2012) conducted the first empirical study to examine the relationship between symptoms of ADHD and OEs in 116 gifted adolescents enrolled in a summer camp for the intellectually gifted in the southern United States. The study was meant to motivate an exhaustive research process to investigate this relationship due to the abundance of speculation in the field of gifted education regarding the misdiagnosis of gifted students due to higher OEs (Rinn & Reynolds, 2012). Rinn and Reynolds (2012) found significant correlations between psychomotor, sensual, and imagination OEs and at least one sub-score on the *Conners' ADHD scale*. The authors caution that the results do not particularly imply misdiagnosis but shed the light on the relationship between ADHD symptoms and OEs in gifted adolescents (Rinn & Reynolds, 2012). For example, they suggest that the psychomotor overexcitability subscale and the questions related to the hyperactive-impulsive subscale measure the same thing and thus knowledge about the overlap and investigation of other distinguishing features are essential to avoid misdiagnosis (Rinn & Reynolds, 2012). Al Hroub and Krayem (2020) also investigated the overlap between ADHD symptoms and OEs in 265 intellectually gifted adolescents in the Jubilee School for Gifted and Talented in Jordan. The researchers' findings partially support Rinn and

Reynold's (2012) findings: both the psychomotor OE subscale and the imaginational OE subscale are positively correlated to the hyperactive-impulsive subscale and the imaginational OE subscale is positively correlated to the inattentive subscale. However, the results of these studies concerning the other forms of OEs do not converge (Al-Hroub & Krayem, 2020; Rinn & Reynolds, 2012). While both these studies provide empirical evidence that the potential of misdiagnosis due to higher OEs and their overlap with ADHD symptoms does exist, a study conducted in Turkey revealed that there was no relationship between psychomotor OE and ADHD diagnosis by comparing psychomotor OEs of gifted high-school students with and without ADHD diagnosis (total N=393) and average ability students (N=351) (as cited in Lovecky, 2018). While some researchers conclude that it is valid to assume that misdiagnosis may occur due to overlap between ADHD symptoms and OEs (Al-Hroub & Krayem, 2020; Rinn & Reynolds, 2012), Lovecky (2018) maintains that the evidence is not enough and it is unlikely that OEs, particularly psychomotor OE as claimed, is a reason gifted children are being misdiagnosed with ADHD. Rinn and Reynolds (2012) suggest that researchers should continue to explore this interaction between OEs and ADHD characteristics and extend it to the general population. To the researcher's knowledge, there are no studies that empirically investigate the relationship between OEs and ADHD in the general population.

Creativity and ADHD

Healey and Rucklidge (2005) warn that most of the research concerning the similarities between ADHD and creativity is theoretically based on descriptions of creative people and reasons why the two constructs might overlap. The empirical research available leads to contradictory conclusions: some studies have revealed that children with ADHD are more creative than their typical peers on some tasks (Abraham et al., 2006; Fugate et al., 2013; Healey

and Rucklidge, 2006; Ten et al., 2020), others have revealed no significant differences in performance on some tasks (Abraham et al., 2006; Aliabadi et al., 2016; Healey and Rucklidge, 2005; Ten et al., 2020), and some have revealed that children with ADHD are even less creative than their typically developing peers on some tasks (Abraham et al., 2006; Aliabadi et al., 2016; Healey & Rucklidge, 2005).

In the same study by Abraham et al. (2006), children with ADHD outperformed typical peers on one creativity measure, performed worse on another, and performed similarly on some measures. Abraham et al. (2006) compared 11 children with a clinical diagnosis of ADHD, 11 children with conduct disorder, and 21 controls without a diagnosis on several measures of creativity: conceptual expansion, creative imagery, ability to overcome the confinements of recently activated knowledge, and ability to generate alternate uses for common objects. The children ranged in age between 12 and 15 years old and were age and IQ-matched. The children with ADHD only outperformed their peers on the recently activated knowledge task. They performed similarly on the conceptual expansion task, alternate uses task, and creative imagery-originality task. They performed worse on the creative imagery-practicality task (Abraham et al., 2006).

Aliabadi et al (2016) compared 33 children with a clinical diagnosis of ADHD in Iran to 33 age and sex-matched controls on their performance on the subscales of the Torrance Test for Creative Thinking (TTCT). The children ranged in age between 7 and 12. They performed similarly on the originality subscale and the typical group outperformed the ADHD group on the fluency and flexibility subscales. Healey and Rucklidge (2005) compared 33 children with a clinical ADHD diagnosis in New Zealand to 34 typical children with TTCT and Maier's Two String Problem. They found that the two groups performed similarly on all subscales with one

exception: typical children outperformed the children with ADHD on the measure of elaboration on ideas (Healey & Rucklidge, 2005).

Ten et al. (2020) investigated the same claims regarding ADHD and creativity while strictly controlling whether or not the diagnosed children were medicated. The participants in the study by Aliabadi et al. (2016) were under the influence of medication while taking the TCCT while Healey and Rucklidge (2005) had asked the participants not to take medication for 24 hours before the test. Ten et al. (2020) compared 22 children with a clinical diagnosis of ADHD who were medicated at the time of the study, 21 children with a clinical diagnosis of ADHD without a history of medication, and 43 controls. The children ranged in age between 8 and 12 years old and were matched based on age, gender, and academic achievement/IQ (Ten et al., 2020). The un-medicated children with ADHD outperformed both groups on an open-ended creativity task. They performed similarly to typical peers on a close-ended creativity task (Ten et al., 2020).

While the above studies all included children clinically diagnosed with ADHD, Healey, and Rucklidge (2006) found that 40% of 30 creative children displayed elevated symptoms of ADHD but none of them qualified for a diagnosis. In another study with subjects with subclinical symptoms of ADHD, Fugate et al. (2013) found that the 17 gifted students with elevated symptoms of ADHD outperformed 20 gifted students who served as controls on divergent thinking. Additionally, 53% of the gifted students with ADHD symptoms scored at or above the 70^{th} percentile on the TTCT creativity index (Fugate et al., 2013).

The relationship between creativity and ADHD remains unclear. The reported results are mixed and the samples recruited in all of the above-mentioned studies are small. Further investigation of this relationship is warranted.

Summary

As reviewed in this chapter, there are claims in the literature that creative students are often mislabeled as having ADHD. A potential explanation for the claim is the students' OEs that overlap in their manifestation with the symptoms of ADHD. The creativity-OE relationship is inconclusive. The relationship between ADHD and creativity is controversial. No studies have investigated these claims and the relationships among Lebanese high-school students, which makes this, study an important exploratory study in the Lebanese context.

CHAPTER 3

METHODOLOGY

This chapter delineates the research design used, the sampling method, the data collection tools, and procedure, and the data analysis techniques.

Research Design

The design of the study is a quantitative non-experimental design, particularly correlational research that additionally employs group comparison. The study aims to answer three questions:

- What are the roles of Lebanese high-school students' gender, five forms of OEs, and three subscales of ADHD in predicting five domains of creativity?
- What is the relationship between the five forms of OEs and ADHD scales among Lebanese high-school students?
- What are the gender differences in OE and ADHD levels among Lebanese high-school students?

To answer the first research question, gender, the five forms of OEs, and three ADHD subtypes were treated as the predictor variables, and the five domain-specific creativity scales were treated as the predicted variables. To answer the second research question, the three subscales of ADHD were treated as the predictor variables and the five forms of OEs were treated as predicted variables. To answer the third research question, a group comparison design was used in which the sample was divided into two groups based on gender, such that the five forms of OEs were the dependent variable in one comparison, and ADHD levels in another.

Sampling

The population in this study was defined as Lebanese high school students in grades 10, 11, and 12 attending private schools in the District of Saida. According to the most recent available data from the Center for Educational Research and Development (2018) at the time of data collection, there were approximately 2800 high school students registered in private schools in Saida distributed across 23 schools. Excluding 5 schools in which the number of high-school students in total was below 35, there were approximately 2700 students distributed across 18 schools: approximately 1000 students across 7 schools in which the language of instruction is English, and approximately 1700 students across 11 schools in which language of instruction is either English or French. Using a sample size calculator, it was estimated with a 5% margin of error and a 99% confidence level that a sample size of 540 students is appropriate given a population of 2700. All 18 schools were invited to participate in the study. Participants were recruited based on (a) the school's willingness to participate in the study; (b) the student's willingness to participate in the study; and (b) parental consent.

Data Collection Tools

The following tools were administered in this study.

Demographic Information Form

A demographic information form requesting information about students' age, gender, and grade level was used. The form was made available in Arabic and English.

Overexcitability Questionnaire - Two (OEQ-II)

The overexcitability questionnaire is a 50-item self-rating scale developed by Falk et al. (1999) to measure the five forms of Dabrowski's overexcitabilities: psychomotor, sensual,

imaginational, intellectual, and emotional (See Appendix A). It was developed through consultations with researchers familiar with Dabrowski's theory (Falk et al., 1999). The questionnaire has 10 items per overexcitability that are distributed randomly and measured on a scale from 1 to 5, with 1 being “not at all like me” and 5 being “very much like me” (Falk et al., 1999). Items on the questionnaire include statements such as “I am deeply concerned about others” and “I feel like my body is constantly in motion” (Falk et al., 1999). To get a total score, scores are summed for each of the OEs, after the reversal of scores on items 38 and 44, and then divided by 10 to maintain a score from 1 to 5 (Falk et al., 1999).

The tool was initially tested with 563 university students ranging in age from 15 to 62 years old with 65% of them being between 18 and 21 years old (Falk et al., 1999). Factor analysis resulted in five factors that were conceptually clear, theoretically relevant, and well-aligned with the five OEs (Falk et al., 1999). The summed items on each factor approximated a normal distribution (Falk et al., 1999). Reliability analysis yielded values of Cronbach alpha exceeding 0.84 for each of the five forms of OEs: 0.86 for psychomotor OE, 0.89 for sensual OE, 0.85 for imaginational OE, 0.89 for intellectual OE, and 0.84 for emotional OE (Falk et al., 1999). This tool is quick to complete and has yielded a high response rate (Falk et al., 1999). It was written for an 8th-grade reading level. It is an ordered-metric scale and thus parametric statistical analysis of the scores obtained by the tool is considered appropriate (Falk et al., 1999).

Al-Onizat (2013) created an Arabic version of the OEQII. The tool was tested on a sample of 289 Jordanian students ranging in age between 15 and 17 years old (Al-Onizat, 2013). It was initially translated and then back-translated from English to Arabic and reviewed by 10 experts at Jordan University and Arabian Amman University (Al-Onizat, 2013). Expert judgment was taken into consideration to modify the items on the questionnaire and establish content

validity (Al-Onizat, 2013). Factorial validity coefficients ranged between 0.30 and 0.69 for Imaginational OE, 0.34 and 0.67 for Sensual OE, 0.46 and 0.78 for Psychomotor OE, 0.37 and 0.60 for Emotional OE, and 0.48 and 0.69 for Intellectual OE (Al-Onizat, 2013). Al-Onizat (2013) found the test-retest reliability coefficients and internal consistency through Cronbach alpha. Test-retest reliability ranged from 0.73 for Psychomotor OE to 0.85 for Imagination OE. The whole scale had a reliability coefficient of 0.85. Cronbach alpha ranged from 0.74 for psychomotor OE to 0.84 for intellectual OE. The scale as a whole had a Cronbach alpha value of 0.91. Scores on each of the subscales approximated a normal distribution (Al-Onizat, 2013).

Kaufman Domains of Creativity Scale (K-DOCS)

The Kaufman Domains of Creativity Scale is a 50-item self-report behavior-based rating scale developed by Kaufman (2012) as a measure of self-perceived domain-specific creativity across five domains: self/everyday, scholarly, performance, mechanical/scientific, and artistic. This tool is based on the APT and complementary 4C models of creativity and is meant to assess little c domain-specific creativity. The tool asks people to rate whether they perceive themselves to be more or less creative than their age-peers with similar life experience on a 5-point Likert scale ranging from 1 which is “much less creative” to 5 which is “much more creative”. Items on the questionnaire include statements such as “thinking of new ways to help people” on the everyday creativity subscale, “analysing the themes in a good book” on the scholarly creativity subscale, “writing a poem” on the performance creativity subscale, “solving math puzzles” on the mechanical/scientific creativity subscale, and “sketching a person or object” on the artistic creativity subscale. The scale is scored by summing scores on each of the subscales. While a global score is possible, it is not recommended. Test-retest reliability with a two-week interval

yielded values of reliability of 0.80 for the self/everyday creativity subscale, 0.76 for the scholarly creativity subscale, 0.86 for the performance creativity subscale, 0.78 for mechanical/scientific creativity subscale, and 0.81 for artistic creativity subscale. Kaufman (2012) provided evidence for the five-factor structure of the tool and found some evidence of convergent validity. McKay et al (2017) also found overall evidence for the convergent and discriminant validity of the tool concluding that K-DOCS is a theoretically and psychometrically reliable and valid measure to assess self-perceived domain-specific creativity. The tool has been translated into several languages and used in empirical research (Kandemir & Kaufman, 2019).

Conners 3rd Edition Self-Report Scale

Conners 3 (ADHD/DSM-IV-TR) is a 99-item self-report scale (See Appendix B) used with children aged 8 to 18 to measure ADHD and its most common comorbid problems and disorders (Gallant et al., 2008). Items on the scale are rated on a 4 point Likert type scale ranging from 0 (not true at all, never, seldom) to 3 (very much true, very often, very frequent) and result in four subscale scores: Conners ADHD index; DSM-IV-TR: Inattentive; DSM-IV-TR: Hyperactive-Impulsive; and DSM-IV-TR: Total combination inattentive and hyperactive (Conners, 2008). The internal consistency coefficient calculated using Cronbach's alpha yielded values ranging between 0.77 and 0.97. For the ADHD-hyperactivity-impulsivity subscale, Cronbach's alpha was 0.86 (Gallant et al., 2008). For the ADHD-inattentive subscale, Cronbach's alpha was 0.89. Cronbach's alpha for the ADHD index was 0.84. The scale is a psychometrically sound tool (Gallant et al., 2008), with evidence of convergent and divergent validity (Kao & Thomas, 2010). It is efficient, easy to administer, and requires minimal training for the administrator (Kao & Thomas, 2010). The tool has been translated into Arabic and used with gifted students in Jordan (Al-Hroub & Krayem, 2020).

Procedure

K-DOCS was adapted to be used in this study. IRB approval was sought before contacting schools to allow sampling from their schools. Data collection was arranged with students who consented to participate and whose parents provided consent as well.

Tool Adaptation

K-DOCS has been previously validated with adult participants (Kaufman, 2012; McKay et al., 2017). In case the person has not engaged in the specific activities mentioned in the questionnaire, the person is asked to rate their perceived creative potential based on engagement in a similar task (Kaufman, 2012). Thus, it is possible to modify the wording of some items to reflect a similar task within the same domain (Al-Hroub, personal communication, 2020; Kaufman, 2020, personal communication). The researcher has scrutinized the applicability of the items for the target population and deemed them applicable except for 5 items that were modified (See Appendix C). The researcher translated the modified version of K-DOCS into Arabic and then requested a colleague to back-translate it into English. The expert judgment of two professors of educational psychology at the American University of Beirut was requested to establish content validity.

IRB Approval

The researcher sought IRB approval to conduct the study. Upon approval, the researcher proceeded with the following.

Recruitment

All 18 big secondary schools in Saida, with a large number of students, were invited via email/phone to participate in the study. Upon documented approval, the researcher requested a

10-minute online meeting with the students to briefly explain the purpose of the study. The researcher met with the student via platforms used by the schools such as Zoom, Google Meets, or Microsoft Teams to explain the purpose of the study and answer any questions. The researcher then asked the school to send the following to the parents: an invitation flyer, a parent consent form to be filled out online, a child assent form to be read by the student ahead of the data collection, and an ADHD information sheet. All students who were willing to participate and whose parents provided parental consent were selected.

Data Collection

Parental consent was obtained electronically. All data were collected online. The researcher requested that the school arranges a 30-minute online meeting with the selected students in which they were sent the link to fill out the survey and were given the chance to inquire about any ambiguities. Schools arranged the meeting during school time or outside of school time depending on the flexibility of their schedules and the availability of the students. Data was anonymous. It is saved on a password-protected computer. An incentive in the form of a prize was awarded to three participants randomly selected to incentivize the students to participate.

Data Analysis

The first step in data analysis was testing for normality, as normality is one of the assumptions made in the other statistical methods to be used. Data were tested for normality by calculating skewness and kurtosis. To examine the role of students' gender, OEs, and ADHD in the prediction of creativity domains, hierarchical multiple regression was used. In social scientific research, hierarchical multiple regression is used to determine whether and to what extent multiple independent variables predict the variation in the dependent variable of interest (Sergin,

2010). It allows the determination of the independent variables that have the most predictive power (Sergin, 2010). Hierarchical multiple regression assumes independent random sampling, linear relationships between the independent and dependent variables, and consistent values of prediction errors (Sergin, 2010). In case relationships are not linear, non-linear models are available. The technique also assumes a normal distribution of variables however; it is robust enough against the violation (Sergin, 2010). Assumptions were tested before commencing the analysis. To examine the relationship between OEs and ADHD, canonical correlation analysis (CCA) was used. CCA is a multivariate statistical analysis method that is appropriate when a researcher wants to examine the relationship between 2 sets of variables, with each set containing at least 2 variables (Bluementritt, 2010; Sherry & Henson, 2012). The aim is to identify the patterns of variables that will produce the highest predictive power when combined (Bluementritt, 2010; Sherry & Henson, 2012). Like other multivariate methods, CCA limits the risk of Type I error by reducing the number of statistical tests required (Sherry & Henson, 2012). This method is theoretically consistent to find the overlap between OE trains and ADHD types (Al-Hroub & Krayem, 2020) as important relationships will not be missed as may be the case with univariate methods (Sherry & Henson, 2012). CCA also presumes within it other statistical analyses (multiple regression, Pearson correlation) making it a comprehensive technique (Sherry & Henson, 2012). CCA assumes that variables and their linear combinations approximate the normal distribution however the technique is robust when samples are large (Blumentritt, 2010). The data collection tools should have high reliability with coefficients of at least 0.80 as the method requires minimal measurement error. Consequently, sampling methods that enhance variability in scores are recommended. Samples should also be large for stability. As in multiple regression, the technique in its conventional form requires linear relationships among variables

however algorithms for non-linear relationships are also available. Finally, high multicollinearity among variables used in CCA reduces the magnitudes of correlation coefficients (Blumentritt, 2010). To determine the differences in OEs and ADHD levels across gender, an independent t-test was used, which is beneficial to determine whether the two means differ significantly (Gall et al., 2014). It is arguably the most commonly used statistical procedure for comparing differences in means between two independent groups (Gall et al., 2014).

CHAPTER 4

RESEARCH FINDINGS

The results in this chapter are divided into four parts. The first part describes the participants. The second part focuses on the role of gender, the five OEs as measured by the *OEQII*, and three subtypes of ADHD as measured in *Conners 3* in predicting five domains of creativity as measured in *KDOCS*. The third part focuses on the relationship between the five forms of OEs and three subscales of ADHD for the whole sample and by gender. The fourth part focuses on the mean differences in levels of OEs and ADHD in males and females.

Descriptive Statistics

The survey link was viewed by 1509 students. Out of the total recipients, 23.8% (*N*=360) of students submitted responses. After removing incomplete responses and invalid outliers, the total sample size was 240 students (15.9% of recipients) divided into 86 males (35.83%) and 154 females (64.17%). Most of the students were 10^{th} graders (41.9%), followed by 11^{th} graders (39%), and lastly 12^{th} graders (19.1%). The students ranged in age between 15 and 19 years old with a mean age of 16.2 years old (*SD* = 0.90). Tables 1, 2, and 3 respectively show the means, standard deviation, skewness, and kurtosis for OEs, creativity scores, and ADHD scores for the sample treated as a whole and per gender.

With respect to overexcitabilities, the sample was found to be highest in intellectual OE (*M* = 3.65, *SD* = .60) and emotional OE (*M* = 3.63, *SD* = .68) followed by sensual OE (*M* = 3.37, *SD* = .68), psychomotor OE (*M*=3.12, *SD* = .67), and imaginational OE (*M* = 2.97, *SD* = .80). The OE rankings were found to be similar for females (intellectual > emotional > sensual > psychomotor > imaginational) and males (intellectual > emotional > psychomotor > sensual >

imaginational) with only psychomotor and sensual OEs switching ranking for males. Based on the values for skewness and kurtosis, the distribution of each of the OEs for the entire sample and males and females separately can be considered normal.

With respect to creativity, the sample was found to be highest in everyday creativity (*M* = 3.85, *SD* = .56), followed by scholarly creativity (*M* = 3.46, *SD* = .62), then artistic creativity (*M* = 3.14, *SD* = .76), scientific creativity (*M* = 2.87, *SD* = .76) and lastly performance creativity (*M* = 2.79, *SD* = .78). The rankings were similar for both males and females. Skewness and kurtosis were all within acceptable values. Even though the skewness statistic of .78 for artistic creativity indicates a moderately skewed distribution, values of skewness between -1.0 and +1.0 are excellent for most psychometric purposes (George & Mallery, 2020).

As for ADHD subscales, values of skewness for inattention in the whole sample and females, for hyperactivity-impulsivity in the whole sample and males, and Conners ADHD index in the whole sample and females indicated a moderately skewed distribution but are also within acceptable values for psychometric purposes (George & Mallery, 2020). Additionally, the Z score obtained by dividing the skewness statistic by its standard error is also within acceptable values (Mishra et al., 2019) for each of the variables ($-3.25 < Z < +3.25$ for a sample $50<N<300$) indicating normal distribution except for Conners ADHD for the whole sample.

The correlation matrix showing the Pearson correlation between all the variables is shown in Table 4. Noteworthy are the statistically significant moderate and large correlations between variables at a significance level of $p < .001$.

Table 1

Mean, standard deviation, and normality statistics by gender for Overexcitabilities

Symptom Scale	Sample	*M*	*SD*	Skewness		Kurtosis	
				Statistic	*Standard Error*	*Statistic*	*Standard Error*
Intellectual OE	All (N=240)	3.65	0.60	-0.18	0.16	-0.10	0.31
	M (N=86)	3.63	0.60	-0.33	0.26	-0.13	0.51
	F (N=154)	3.66	0.60	-0.09	0.20	-0.07	0.39
Imaginational OE	All (N=240)	2.97	0.80	0.16	0.16	-0.30	0.31
	M (N=86)	2.86	0.80	0.18	0.26	-0.13	0.51
	F (N=154)	3.03	0.79	0.16	0.20	-0.37	0.39
Emotional OE	All (N=240)	3.64	0.68	-0.37	0.16	-0.12	0.31
	M (N=86)	3.33	0.64	-0.11	0.26	-0.77	0.51
	F (N=154)	3.81	0.65	-0.61	0.20	0.81	0.39
Sensual OE	All (N=240)	3.37	0.68	-0.07	0.16	-0.30	0.31
	M (N=86)	3.11	0.69	0.14	0.26	-0.12	0.51
	F (N=154)	3.52	0.63	-0.08	0.20	-0.32	0.39
Psychomotor OE	All (N=240)	3.12	0.67	-0.15	0.16	-0.39	0.31
	M (N=86)	3.27	0.69	-0.27	0.26	-0.25	0.51
	F (N=154)	3.04	0.64	-0.14	0.20	-0.44	0.39

Note. M refers to males, and F refers to females.

Table 2

Mean, standard deviation, and normality statistics by gender for creativity domains

Symptom Scale	Sample	*M*	*SD*	Skewness		Kurtosis	
				Statistic	*Standard Error*	*Statistic*	*Standard Error*
Everyday Creativity	All (N=240)	3.85	0.56	-0.12	0.16	-0.31	0.31
	M (N=86)	3.81	0.54	-0.25	0.26	0.24	0.51
	F (N=154)	3.87	0.57	-0.07	0.20	-0.56	0.39
Scholarly Creativity	All (N=240)	3.46	0.62	0.07	0.16	-0.26	0.31
	M (N=86)	3.34	0.59	-0.11	0.26	-0.35	0.51
	F (N=154)	3.52	0.63	0.12	0.20	-0.30	0.39
Performance Creativity	All (N=240)	2.79	0.78	0.29	0.16	-0.09	0.31
	M (N=86)	2.58	0.75	0.31	0.26	0.02	0.51
	F (N=154)	2.91	0.77	0.30	0.20	-0.13	0.39
Scientific Creativity	All (N=240)	2.87	0.76	0.10	0.16	-0.35	0.31
	M (N=86)	3.12	0.72	-0.42	0.26	-0.14	0.51
	F (N=154)	2.73	0.75	0.40	0.20	0.10	0.39
Artistic Creativity	All (N=240)	3.14	0.76	0.20	0.16	-0.58	0.31
	M (N=86)	2.81	0.72	0.78	0.26	0.24	0.51
	F (N=154)	3.32	0.72	-0.02	0.20	-0.38	0.39

Note: M refers to males, and F refers to females.

Table 3

Mean, standard deviation, and normality statistics by gender for ADHD subscales

Symptom Scale	Sample	*M*	*SD*	Skewness		Kurtosis	
				Statistic	*Standard Error*	*Statistic*	*Standard Error*
Inattention ADHD	All (N=240)	1.13	0.58	0.50	0.16	0.10	0.31
	M (N=86)	1.10	0.55	0.36	0.26	0.16	0.51
	F (N=154)	1.15	0.60	0.54	0.20	0.05	0.39
Hyp_Imp ADHD	All (N=240)	0.98	0.52	0.50	0.16	-0.24	0.31
	M (N=86)	1.01	0.51	0.53	0.26	-0.39	0.51
	F (N=154)	0.97	0.53	0.49	0.20	-0.14	0.39
Conners ADHD	All (N=240)	0.97	0.53	0.56	0.16	-0.01	0.31
	M (N=86)	0.98	0.49	0.38	0.26	-0.05	0.51
	F (N=154)	0.96	0.55	0.65	0.20	0.01	0.39

Demographic variables did not highly correlate with any of the variables apart from a moderate correlation between gender and each of emotional OE (r = .34) and artistic creativity (r = .32).

Upon examining the correlation among the OEs, significant moderate correlations were found between emotional OE and sensual OE (r = .48), intellectual OE and sensual OE (r = .42), emotional OE and imaginational OE (r = .41), intellectual OE and imaginational OE (r = .40), imaginational OE and sensual OE (r = .38), and intellectual OE and emotional OE (r = .32).

Upon examining the correlation among the creativity domains, significant large correlations were found between performance creativity and artistic creativity (r = .57) and

everyday creativity and scholarly creativity (r = .50). Significant moderate correlations were found between scholarly creativity and performance creativity (r = .37), scholarly creativity and artistic creativity (r = .30), and scientific creativity and artistic creativity (r = .30).

All of the ADHD subscales were highly correlated. Significant large correlations were found between inattention and Conners ADHD index (r = .82), hyperactivity-impulsivity and Conners ADHD index (r = .77), and inattention and hyperactivity-impulsivity subscales (r = .62).

Some OEs also correlated with creativity domains and ADHD subscales. There was a significant large correlation between intellectual OE and scholarly creativity (r = .67) and moderate correlations between intellectual OE and each of everyday creativity (r = .46), artistic creativity (r = .37), performance creativity (r = .31), and scientific creativity (r = .30).

A significant moderate correlation was found between psychomotor OE and everyday creativity (r = .39), emotional OE and each of everyday creativity (r = .33), and performance creativity (r = .32). A large correlation was found between sensual OE and artistic creativity (r = .57) and moderate correlations were found between sensual OE and each of everyday creativity (r = .41) and performance creativity (r = .37). There were no significant moderate or large correlations between imaginational OE and any of the creativity domains.

Some of the OEs also correlated with some of the ADHD subscales. There was a significant moderate correlation between psychomotor OE and the hyperactivity-impulsivity subscale (r = .34) and between emotional OE and inattention (r = .32). There were also significant moderate correlations between imaginational OE and each of inattention (r = .45), hyperactivity-impulsivity (r = .40) and Conners ADHD index (r = .42). There were no significant moderate or large correlations between intellectual OE or sensual OE and any of the ADHD

subscales. There were no significant moderate or large correlations between the creativity domains and the ADHD subscales either.

Table 4

Correlation Matrix between all variables

	Age	Gender	Int. OE	Imag. OE	Emo. OE	Sens. OE	Psych. OE	Everyday Creativity	Scholarly creativity	Performance creativity	Scientific creativity	Artistic creativity	Inattention	Hyp_Imp	Conners ADHD Index
Age	1.00														
Gender	.00	1.00													
Int. OE	-.07	.02	1.00												
Imag. OE	-.12	.10	.40***	1.00											
Emo. OE	-.05	.34***	.32***	.41***	1.00										
Sens. OE	-.10	.29***	.42***	.38***	.49***	1.00									
Psych. OE	-.03	-.16*	.29***	.12	.16*	.15*	1.00								
Everyday creativity	-.01	.05	.46***	.04	.33***	.41***	.39***	1.00							
Scholarly creativity	-.11	.14*	.66***	.18**	.29***	.28***	.18**	.50***	1.00						
Performance creativity	-.18**	.21**	.31***	.20**	.32***	.37***	.20**	.24***	.37***	1.00					
Scientific creativity	-.08	-.25***	.30***	-.08	-.03	.04	.24***	.25***	.27***	.26***	1.00				
Artistic creativity	-.12	.32***	.37***	.27***	.26***	.57***	.13*	.28***	.30***	.57***	.30***	1.00			
Inattention	-.02	.04	.03	.45***	.32***	.07	.02	-.26***	-.11	.13*	-.16*	.02	1.00		

Hyp_Imp	.00	-.04	.24***	.40***	.27***	.07	.34***	.02	.05	.18**	-.02	.05	.62***	1.00	
Conners ADHD index	-.03	-.01	.14*	.42***	.20**	.02	.13*	-.20**	.00	.18**	-.07	.05	.82***	.77***	1.00

***$p < .001$, **$p < .01$, *$p < .05$

The Role of Demographics, OEs, and ADHD in Predicting Creativity

Hierarchical multiple regression was utilized to examine the role of demographic variables, OEs, and ADHD in predicting creativity domains. First, the Pearson correlation between each of the predictor variables and each creativity domain was observed. Only variables with a statistically significant correlation to the examined criterion variable were used in the regression analysis. The relevant assumptions to this statistical method were first tested. The regression analysis was conducted in two ways. First, hierarchical multiple regression was conducted with the demographic variables, OEs, and ADHD entered simultaneously each in one Block to test the contribution of each set in predicting creativity. Only statistically significant relationships were carried on to the next analysis. In the second analysis, the individual contribution of each variable from the set of variables was analyzed by entering the sets in Blocks using the Stepwise method. The results of the analysis are reported below.

Testing Assumptions

The variable types in this study met the criteria: the dependent variable could be measured on a continuous scale while the independent variable could either be measured on a continuous scale or is categorical. One independent variable, the ADHD Conners index, was removed from the analysis so that the data meets the assumption of no collinearity. Outliers were also eliminated. The data met the assumption of no independent errors (Durbin-Watson between 1.5 and 2.5). Analysis of the scatter plots revealed that assumptions for linearity and homoscedasticity were also met.

The Role of Demographics, OEs, and ADHD in Predicting Everyday Creativity

Correlation coefficients were found between each of the predictor variables and the criterion variable everyday creativity. Statistically significant correlations at $p < .001$ were found between everyday creativity and each of intellectual OE, $r(238) = .46$, sensual OE, $r(238) = .41$, psychomotor OE, $r(238) = .39$, and emotional OE, $r(238) = .33$. Additionally, a statistically significant negative correlation was found between everyday creativity and each of inattention, $r(238) = -.26$, $p < .01$, and Conners ADHD index, $r(238) = -.20$, $p < .001$.

To test the contribution of OEs and ADHD subscales in predicting everyday creativity, a hierarchical multiple regression was conducted. Predictors with non-significant correlations were dropped from the regression model. Additionally, due to the high correlation between ADHD inattention subscale and Conners ADHD index, $r(238)=.82$, $p <.001$, Conners ADHD index was dropped from the regression analysis.

Intellectual, psychomotor, emotional, and sensual OEs were simultaneously entered in Block 1, and inattention was entered in Block 2. The regression showed that the OEs accounted for 33% of the variance in the everyday creativity score ($R^2_{adjusted} = .33$, $\Delta F(4,235) = 30.87$, $p < .001$). Controlling for OEs, inattention accounted for an additional 11.6% of the variance in everyday creativity ($R^2_{adjusted} = .45$, $\Delta R^2_{adjusted} = .12$, $\Delta F(1,234) = 50.31$, $p < .001$). All of the entered predictors together accounted for 45.6% of the variance in the everyday creativity score.

To further investigate the unique contribution of each OE predictor, a hierarchical multiple regression was again conducted, with a stepwise selection procedure used for Block 1. The regression results summarized in Table 5 illustrated that among the four investigated OEs, intellectual OE was the most influential predictor of everyday creativity and accounted for the largest proportion (i.e., 21%) of the variance ($R^2_{adjusted} = .21$, $\Delta F(1,238) = 64.39$, $p <$

.001). Psychomotor and sensual OEs accounted for 6.9% and 4.7% of the variance in everyday creativity scores respectively. Emotional OE was excluded from the model. Table 6 summarizes the standardized regression coefficients for the variables included in the model.

Table 5

Model summary of the simultaneous multiple regression predicting everyday creativity

Predictor		R^2	$R^2_{adjusted}$	ΔR^2	ΔF	df_1	df_2
Block 1: Overexcitabilities							
Model 1	Intellectual	0.213	0.210	0.213	64.39***	1	238
Model 2	Intellectual OE, Psychomotor OE	0.285	0.279	0.072	23.87***	1	237
Model 3	Intellectual OE, Psychomotor OE, Sensual OE	0.335	0.326	0.050	17.73***	1	236
Block 2: ADHD subscales							
Model 4	Intellectual OE, Psychomotor OE, Sensual OE, ADHD Inattention	0.418	0.408	0.083	33.63***	1	235

***p <.001

Table 6

Summary of the coefficients in the stepwise regression for model 4

	Standardized Beta coefficient	*t*	CI (95%)
Block 1: Overexcitabilities			
Intellectual OE	0.28	4.85***	[0.15, 0.36]
Psychomotor OE	0.28	5.32***	[0.15, 0.32]
Sensual OE	0.27	4.86***	[0.13, 0.31]
Block 2: ADHD subscales			
ADHD inattention	-0.29	- 5.80***	[-0.37, -0.18]

***$p < .001$

The Role of Demographics, OEs, and ADHD in Predicting Scholarly Creativity

Correlation coefficients were found between each of the predictor variables and the criterion variable scholarly creativity. Statistically significant correlations at $p < .001$ were found between scholarly creativity and each of intellectual OE, $r(238) = .67$, emotional OE, $r(238) = .29$, and sensual OE, $r(238) = .28$. Statistically significant correlations at $p < .01$ were also found between scholarly creativity and each of psychomotor OE, $r(238) = .18$ and imaginational OE, $r(238)=.18$. Additionally, a statistically significant correlation at $p<.05$ was found between scholarly creativity and gender, $r(238) = .14$ but no statistically significant correlations were found between scholarly creativity and age or any of the ADHD subscales.

To test the contribution of gender and OEs in predicting scholarly creativity, a hierarchical multiple regression was conducted. Gender was entered in Block 1 and the five OEs were simultaneously entered in Block 2. The predictors accounted for 45.1% of the variance in the scholarly creativity score. The regression showed that gender accounted for 1.5% of the variance in scholarly creativity score ($R^2_{adjusted} = .02$, $\Delta F(1,238) = 4.71$, $p < .05$). Controlling for gender, OEs accounted for 43.6% of the variance in scholarly creativity ($R^2_{adjusted} = .45$, $\Delta R^2_{adjusted}=.44$, $\Delta F(5,233) = 38.85$, $p < .001$).

To further investigate the unique contribution of each OE predictor, a hierarchical multiple regression was again conducted, with a stepwise selection procedure used for Block 2. The regression results summarized in Table 7 illustrated that, among the five investigated OEs, intellectual OE was the most influential predictor of scholarly creativity and accounted for the largest proportion (i.e., 42.6%) of the variance ($R^2_{adjusted}$ = .44, $\Delta F(1,237) = 182.58$, $p < .001$). Sensual, emotional, imaginational, and psychomotor OEs were excluded from the model. Table 8 summarizes the standardized regression coefficients for the variables included in the model significant at $p < .001$.

Table 7

Model summary of the simultaneous multiple regression predicting scholarly creativity

Predictor		R^2	$R^2_{adjusted}$	ΔR^2	ΔF	df_1	df_2
Block 1: Gender							
Model 1	Gender	0.019	0.015	0.019	4.71*	1	238
Block 2: OEs							
Model 2	Gender, Intellectual OE	0.446	0.441	0.427	182.58***	1	237
Model 3	Gender, Intellectual OE, imaginational OE	0.458	0.451	0.012	5.16*	1	236

***$p < .001$, *$p < 0.05$

Table 8

Summary of the coefficients in the stepwise regression for model 2

	Standardized Beta coefficient	*t*	CI (95%)
Block 1: Gender			
Gender	0.12	2.57*	[0.04, 0.28]
Block 2: OEs			
Intellectual OE	0.65	13.51***	[0.58, 0.78]

***$p < .001$, **$p < .01$, *$p < .05$

The Role of Demographics, OEs, and ADHD in Predicting Performance Creativity

Correlation coefficients were found between each of the predictor variables and the criterion variable performance creativity. Statistically significant correlations at $p < .01$ were found between performance creativity and each of the demographic variables age, $r(238) = -.18$, and gender, $r(238) = .21$. Positive significant correlations at $p < .001$ were also found between performance creativity and each of sensual OE, $r(238) = .37$, emotional OE, $r(238) = .32$ and intellectual OE, $r(238) = .31$. Positive significant correlations at $p < .01$ were found between performance creativity and each of psychomotor OE, $r(238) = .20$, and imaginational OE, $r(238) = .20$. As for performance creativity and ADHD subscales, significant positive correlations were found between the criterion variable and each of ADHD inattention subscale, $r(238)= .13$, $p < .05$, hyperactivity-impulsivity subscale, $r(238) = .18$, $p < .01$, and Conners ADHD index, $r(238) = .18$, $p < .01$.

To test the contribution of demographic variables, OEs, and ADHD subscales in predicting everyday creativity, hierarchical multiple regression was conducted with demographics entered simultaneously in Block 1, OEs in Block 2, and ADHD subscales in Block 3. Due to the high correlation between ADHD inattentive subscale and Conners ADHD index, $r(238) = .82$, $p < .001$, Conners ADHD index was dropped from the regression analysis. The regression showed that demographics alone accounted for 6.8% of the variance in performance creativity score ($R^2_{adjusted} = .07$, $\Delta F(2,237) = 9.68$, $p < .001$). Controlling for demographic variables, OEs accounted for an additional 13.8% of the variance in performance creativity ($R^2_{adjusted} = .21$, $\Delta R^2_{adjusted}=.14$, $\Delta F(5,232) = 9.23$, $p < .001$). ADHD subscales did not significantly contribute to the model.

To further investigate the unique contribution of each demographic variable and OE, a hierarchical multiple regression was again conducted, with a stepwise selection procedure

used for Block 1 and Block 2. The regression results summarized in Table 9 illustrated that, among the investigated variables, sensual OE was the most influential predictor of performance creativity and accounted for the largest proportion (i.e., 9%) of the variance ($R^2_{adjusted}$ = .16, $\Delta F(1,236) = 26.44$, $p < .001$). Gender, intellectual OE, age, and psychomotor OE accounted for 3.9%, 3.1%, 2.9%, and 1.9% of the variance in performance creativity scores respectively. Emotional and imaginational OE were excluded from the model. Table 10 summarizes the standardized regression coefficients for the variables included in model 3.

Table 9

Model summary of the simultaneous multiple regression predicting performance creativity

Predictor		R^2	$R^2_{adjusted}$	ΔR^2	ΔF	df_1	df_2
Block 1: Gender							
Model 1	Gender	0.043	0.039	0.043	10.62**	1	238
Model 2	Gender, age	0.075	0.068	0.033	8.40**	1	237
Block 2: OEs							
Model 3	Gender, age, sensual OE	0.169	0.158	0.093	26.44***	1	236
Model 4	Gender, age, sensual OE, intellectual OE	0.202	0.189	0.034	9.92**	1	235
Model 5	Gender, age, sensual OE, intellectual OE, psychomotor OE	0.219	0.202	0.016	4.89*	1	234

***$p < .001$, **$p < .01$, *$p < .05$

Table 10

Summary of the coefficients in the stepwise regression for model 3

	Standardized Beta coefficient	*t*	CI (95%)
Block 1: Gender			
Gender	0.11	1.84	[-0.01,0.38]
Age	-0.15	-2.50*	[-0.23, -0.03]
Block 2: OEs			
Sensual OE	0.32	5.12***	[0.23, 0.51]

***$p < .001$, **$p < .01$, *$p < .05$

The Role of Demographics, OEs, and ADHD in Predicting Scientific Creativity

Correlation coefficients were found between each of the predictor variables and the criterion variable scientific creativity. Statistically significant correlations at $p < .001$ were found between scientific creativity and each of gender $r(238) = -.25$, intellectual OE, $r(238) = .30$, and psychomotor OE, $r(238) = .24$. Additionally, a statistically significant negative correlation was found between scientific creativity and inattention, $r(238) = -.16$, $p < .05$.

To test the contribution of gender, OEs, and inattention in predicting scientific creativity, hierarchical multiple regression was conducted. Predictors with non-significant correlations were dropped from the regression model. Gender was entered in Block 1, the two OEs in Block 2, and inattention in Block 3. The regression analysis showed that gender alone accounted for 5.7% of the variance in the scientific creativity score ($R^2_{adjusted} = .06$, $\Delta F(1,238) = 15.57$, $p < .001$). Controlling for gender, intellectual and psychomotor OEs accounted for an additional 9.8% of the variance in scientific creativity ($R^2_{adjusted} = .16$, $\Delta R^2_{adjusted} = .10$, $\Delta F(2,236) = 14.75$, $p < .001$). ADHD inattention subscale contributed another 2.5% to the variance ($R^2_{adjusted} = .18$, $\Delta R^2_{adjusted} = .03$, $\Delta F(1,235) = 8.03$, $p < .01$).

To further investigate the unique contribution of each OE, a hierarchical multiple regression was again conducted, with a stepwise selection procedure used for Block 2. The regression results summarized in Table 11 illustrated that, among the investigated variables, intellectual OE was the most influential predictor of scientific creativity and accounted for the largest proportion (i.e., 8.7%) of the variance ($R^2_{adjusted} = .15$, $\Delta F(1,237)=25.33$, $p<.001$). Gender and inattention accounted for 5.7% and 2.3% of the variance in scientific creativity scores respectively. Psychomotor OE was excluded from the model. Table 12 summarizes the standardized regression coefficients for the variables included in model 2.

Table 11

Model summary of the simultaneous multiple regression predicting scientific creativity

Predictor	R^2	$R^2_{adjusted}$	ΔR^2	ΔF	df_1	df_2
Block 1: Gender						
Model 1 Gender	0.061	0.057	0.061	15.57***	1	238
Block 2: OEs						
Model 2 Gender, intellectual OE	0.152	0.145	0.091	25.33***	1	237
Block 3: ADHD Subscales						
Model 3 Gender, intellectual OE, ADHD inattention	0.179	0.168	0.027	7.68**	1	236

***$p < .001$, **$p < .01$, *$p < .05$

Table 12

Summary of the coefficients in the stepwise regression for model 2

	Standardized Beta coefficient	*t*	CI (95%)
Block 1: Gender			
Gender	-0.25	-4.26***	[-0.59,-0.22]
Block 2: OEs			
Intellectual OE	0.30	5.03***	[0.23, 0.53]

***$p < .001$

The Role of Demographics, OEs, and ADHD in Predicting Artistic Creativity

Correlation coefficients were found between each of the predictor variables and the criterion variable artistic creativity. Statistically significant correlations at $p < .001$ were found between artistic creativity and each of gender $r(238) = .32$, sensual OE, $r(238) = .57$, intellectual OE, $r(238) = .37$, imaginational OE, $r(238) = .27$, and emotional OE, $r(238) = .26$. Additionally, a statistically significant correlation was found between artistic creativity and psychomotor OE, $r(238) = .13$, $p < .05$.

To test the contribution of gender and OEs in predicting artistic creativity, a hierarchical multiple regression was conducted. Predictors with non-significant correlations were dropped from the regression model. Gender was entered in Block 1 and the five OEs in

Block 2. The regression analysis showed that gender alone accounted for 9.9% of the variance in the artistic creativity score ($R^2_{adjusted}$ = .10, $\Delta F(1,238) = 27.23$, $p < .001$). Controlling for gender, the five OEs accounted for an additional 27.2% of the variance in artistic creativity ($R^2_{adjusted}$ = .37, $\Delta R^2_{adjusted}$=.27, $\Delta F(5,233) = 21.63$, $p < .001$).

To further investigate the unique contribution of each OE, a hierarchical multiple regression was again conducted, with a stepwise selection procedure used for Block 2. The regression results summarized in Table 13 illustrated that, among the investigated variables, sensual OE was the most influential predictor of artistic creativity and accounted for the largest proportion (i.e., 24.3%) of the variance ($R^2_{adjusted}$ = .34, $\Delta F(1,237) = 89.15$, $p < .001$). Gender and intellectual OE accounted for 9.9% and 2.6% of the variance in artistic creativity scores respectively. Psychomotor, emotional, and imaginational OE were excluded from the model. Table 14 summarizes the standardized regression coefficients for the variables included in model 2.

Table 13

Model summary of the simultaneous multiple regression predicting artistic creativity

Predictor		R^2	$R^2_{adjusted}$	ΔR^2	ΔF	df_1	df_2
Block 1: Gender							
Model 1	Gender	0.103	0.099	0.103	27.22***	1	238
Block 2: OEs							
Model 2	Gender, intellectual OE, psychomotor OE, imaginational OE, emotional OE, sensual OE	0.387	0.371	0.284	21.63***	1	233

*** p <.001

Table 14

Summary of the coefficients in the stepwise regression for model 2

	Standardized Beta coefficient	t	CI (95%)
Block 1: Gender			
Gender	0.17	3.11**	[0.09,0.44]
Block 2: OEs			
Sensual OE	0.52	9.44***	[0.46, 0.70]

***$p < .001$, **$p < .01$, *$p < .05$

Summary of the role of gender, OEs and ADHD in predicting creativity

In summary, everyday creativity correlated positively with intellectual, sensual, psychomotor, and emotional OEs, and negatively with inattention and Conners ADHD index. The analysis showed that all these independent variables combined, excluding the Conners ADHD Index, explained 45.6% of the variance in creativity. Inattention accounted for 11.6% of the variance in the everyday subscale while the major contribution was from the OEs (33%). The most significant predictor of everyday creativity was intellectual OE.

In regards to the scholarly creativity subscale, it correlated positively with gender and all OEs. Gender and all the OEs together accounted for 45% of the variance in the scholarly creativity score. However, gender's contribution was minimal (1.5%) and intellectual OE was the most significant contributor (42.6%). No significant correlation was shown between scholarly creativity and ADHD subscales.

Performance creativity negatively correlated with age and positively correlated with gender, all OEs, and ADHD types. The independent variables together accounted for approximately 21% of the variance in the subscale. Only OEs had a notable contribution (13.8%) to the variance in creativity with sensual OE being the most significant predictor (9%).

Scientific creativity negatively correlated with gender and inattention but positively correlated with intellectual and psychomotor OE. These independent variables explained 16% of the variance in the scientific creativity subscale. The major contribution came from the intellectual and psychomotor OEs (9.8%) with intellectual OE being the highest predictor (8.7%).

When it came to artistic creativity, gender and all of the OEs positively correlated with the subscale and together accounted for 37% of the variance in the artistic creativity subscale score. Gender alone accounted for 9.9% while sensual OE was the most significant predictor of artistic creativity (24.3%). Other OEs were excluded from the model in further analysis.

The Relationship between OEs and ADHD

A canonical correlation analysis was conducted using the 3 ADHD subscales as predictors of the 5 OEs to evaluate the multivariate shared relationship between the two variable sets (i.e., ADHD and overexcitabilities). The analysis yielded three functions with squared canonical correlations (R_c^2) of .309, .194, and .055 for each successive function. Collectively, the full model across all functions was statistically significant using Wilk's λ = .527 criterion, $F(15, 640.85) = 11.159$, $p < .001$. Because Wilk's λ represents the variance unexplained by the model, 1- λ yields the full model effect size in r^2 metric. Thus, for the set of three canonical functions, the r^2 type effect size was .473, which indicates that the full model explained a substantial portion, about 47% of the variance shared between the variable sets.

The dimension reduction analysis allows the researcher to test the hierarchal arrangement of functions for statistical significance. As noted, the full model (Functions 1 to 3) was statistically significant. Functions 2 to 3 and Function 3 tested in isolation were also

statistically significant, $F(8, 466) = 8.469$, $p < .001$, and $F(3, 234) = 4.505$, $p = .004$, respectively. Given the R_c^2 effects for each function, only the first two functions were considered noteworthy in the context of the study (30.87% and 19.38% of the shared variance, respectively). The last function only explained 5.46% of the remaining variance in the variable sets after the extraction of the prior functions.

Table 15 represents the standardized canonical function coefficients and structure coefficients for Functions 1 and 2. The square structure coefficients are also given as well as the communalities (h^2) across the two functions for each variable. Looking at the Function 1 structure coefficients, one sees that the most relevant criterion variable was imaginational OE followed by emotional OE. The two most relevant also tended to have the larger canonical function coefficients. Both variables had the same sign indicating that they were positively related. Regarding the predictor variable set in Function 1, ADHD inattentive was the primary contributor to the predictor synthetic variable followed by ADHD hyperactive-impulsive and then by Conners ADHD index. This was supported by the canonical function coefficients for ADHD inattentive and hyperactive-impulsive as they both had large coefficients while Conners ADHD had a more moderate coefficient. Because the structure coefficients of the variables were also negative, they were positively related to all the OEs.

Moving to Function 2, the coefficients in Table 15 suggest that the most relevant criterion was psychomotor OE followed by intellectual OE. This was also supported by the canonical function coefficients. These variables were positively related to this function. As for ADHD subscales, ADHD hyperactive-impulsive was now the dominant predictor. It was also positively related to the relevant OEs.

Table 15

Canonical Solution for Overexcitabilities predicting ADHD for Functions 1 and 2

	Function 1			*Function 2*			
Variable	*Coef*	r_s	r_s^2 *(%)*	*Coef*	r_s	r_s^2 *(%)*	h^2 *(%)*
Intellectual_OE	.189	-.232	5.38	-.598	-.561	31.47	36.85
Psychomotor_OE	-.279	-.350	12.25	-.739	-.815	66.42	78.67
Emotional_OE	-.494	-.643	41.34	.278	.149	2.22	43.56
Imaginational_OE	-.812	-.843	71.06	.224	.071	0.50	71.56
Sensual_OE	.338	-.169	2.86	.175	.029	0.08	2.94
R^2_c			30.9			19.4	
ADHD inattentive	-.773	-.903	81.54	1.243	.384	14.75	96.29
ADHD hyp_imp	-.653	-.871	75.86	-1.047	-.484	23.43	99.29
Conners ADHD	.333	-.802	64.32	-.263	-.058	0.37	64.69

Note. Structure coefficients (r_S) greater than |.45| are underlined. Communality coefficients (h^2) greater than 45% are underlined. Coef = standardized canonical function coefficient; r_S = structure coefficient; r_S^2 = squared structure coefficient; h^2 = communality coefficient.

Canonical correlation analysis was also conducted to examine the relationship between OE and ADHD symptom scales in relation to gender. The analysis yielded three functions with squared canonical correlations (R_C^2) of .333, .178, and .031 for males, and (R_C^2) of .327, .239, and .053 for females for each successive function.

Collectively, the full model across all functions was statistically significant using Wilks's λ = .530 criterion for males, [F(15, 215.73) = 3.713, p <.001], and Wilks' λ = .485 criterion for females, [F(15, 403.44)= 8.071, p <.001]. Thus for the set of three canonical

functions, the r^2 type effect sizes were .470 for males and .515 for females, which indicates that the full model explained a noteworthy portion, about 47% and 51.5% for males and females respectively, of the variance shared between the variable sets.

The dimension reduction analysis was conducted to test the hierarchal arrangement of functions for statistical significance. As noted, the full model (Functions 1 to 3) was statistically significant for males, [$F(15, 215.73) = 3.713$, $p < .001$], and females, [$F(15, 403.44) = 8.071$, $p < .001$]. Functions 2 to 3 were also statistically significant for males, [$F(8, 158) = 2.391$, $p = .018$], and females, [$F(8, 294) = 6.546$, $p < .001$]. Function 3 tested in isolation was only significant for females [$F(3, 148) = 2.770$, $p = .044$]. Given the R_c^2 effects for each function, only the first two functions for males and females were considered noteworthy in the context of the study (33.29% and 17.86%, for males, and 32.74% and 23.91%, for females, of shared variance, respectively). The last function only explained 3.13% and 5.32% of the remaining variance in the variable sets after the extraction of the prior functions for males and females respectively.

Table 16 represents the standardized canonical function coefficients and structure coefficients for Functions 1 and 2 for males and females. The square structure coefficients are also given as well as the communalities (h^2) across the two functions for each variable. Looking at the Function 1 structure coefficients for males, one sees that the most relevant criterion variables were primarily imaginational OE and emotional OE followed by psychomotor OE. The most relevant variables also tended to have the larger canonical function coefficients with the exception of psychomotor OE. All variables had the same sign indicating that they were all positively related. As for females, the most relevant criterion variables were imaginational OE followed by emotional OE. This conclusion is supported by

the canonical function coefficients. The variables both had the same sign indicating that they were all positively related.

Regarding the predictor variable set in Function 1 for males, ADHD inattentive and hyperactive-impulsive were the primary contributors to the predictor synthetic variable followed by Conners ADHD index. This was supported by the canonical function coefficients as ADHD inattentive and hyperactive-impulsive had larger coefficients while Conners ADHD had a more modest one. Because the structure coefficients of the variables were also negative, they were positively related to all the OEs. As for females, the primary contributor to the predictor synthetic variable was ADHD inattentive followed by Conners ADHD and hyperactive-impulsive. There was a discrepancy in coefficients as hyperactive-impulsive had a larger value than the Conners ADHD index. Because the structure coefficients of the variables were all positive, they positively correlated with the OEs.

Table 16

Canonical Solution for Overexcitabilities predicting ADHD for Functions 1 and 2 by gender

	Function 1						*Function 2*							
Variable	*Coef*		r_s		r_s^2 (%)		*Coef*		r_s		r_s^2 (%)		h^2 (%)	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
Intellectual_OE	.097	-.292	-.242	.194	5.85	3.76	-.649	-.581	-.572	-.570	32.72	32.49	38.57	36.25
Psychomotor_OE	-.393	.161	-.547	.193	29.92	3.73	-.610	-.724	-.644	-.800	41.47	64.00	71.39	67.73
Emotional_OE	-.643	.441	-.678	.670	45.97	44.89	.008	.365	-.211	.145	4.45	2.10	50.42	46.99
Imagináional_OE	-.569	.855	-.682	.886	46.51	78.50	.720	-.101	.223	-.110	4.97	1.21	51.48	79.71
Sensual_OE	.573	-.101	-.028	.269	0.08	7.24	-.215	.363	-.359	.070	12.89	0.49	12.97	7.73
R^2_c					33.29	32.74					17.86	23.91		
ADHD inattentive	-.760	.880	-.855	.938	73.10	87.98	.818	1.383	.515	.253	26.52	6.40	99.62	94.38
ADHD hyp_imp	-.771	.554	-.886	.824	78.50	67.90	-1.262	-.801	-.293	-.562	8.58	31.58	87.08	99.48
Conners ADHD	.491	-.341	-.677	.826	45.83	68.23	.619	-.771	.337	-.259	11.36	6.71	52.54	74.94

Note. Structure coefficients (r_S) greater than |.45| are underlined. Communality coefficients (h^2) greater than 45% are underlined. Coef = standardized canonical function coefficient; r_S = structure coefficient; r_S^2 = squared structure coefficient; h^2 = communality coefficient.

As for the Function 2 squared structure coefficients for males, one sees that the most relevant criterion variable was psychomotor OE followed by intellectual OE. The canonical function coefficients for both variables were high but the order was switched with a larger coefficient for intellectual OE. Both variables' structure coefficients had the same sign indicating that they were positively related. A similar pattern was observed for females with the canonical coefficient functions supporting the conclusion.

Regarding the predictor set in Function 2 for males, ADHD inattentive was the sole contributor to the predictor synthetic variable while it was ADHD hyperactive-impulsive for females. For males, ADHD inattentive was negatively correlated to the OEs while hyperactive-impulsive for females was positively related to the OEs.

Gender Differences in OEs and ADHD

Descriptive statistics were employed to report the OE profiles of 240 high school students: 86 males and 154 females as shown in Table 17. Intensities were found to be highest in intellectual OE (M = 3.65, SD = .60) and emotional OE (M = 3.63, SD = .68) followed by sensual OE (M = 3.37, SD = .68), psychomotor OE (M = 3.12, SD = .67), and imaginational OE (M = 2.97, SD = .80). The OE rankings were found to be similar for females (intellectual > emotional > sensual > psychomotor > imaginational) and males (intellectual > emotional > psychomotor > sensual > imaginational) with only psychomotor and sensual OEs switching ranking for males.

Table 17

Mean Differences in OEs

OEs	All (N = 240)		Males (N = 86)		Females (N = 154)		Mean Difference	*t*-test	Cohen's *d*
	M	SD	M	SD	M	SD			
Intellectual OE	3.65	0.60	3.63	0.60	3.66	0.60	- 0.03	- 0.35	-0.05
Imaginational OE	2.97	0.80	2.86	0.80	3.03	0.79	- 0.17	- 1.59	-0.21
Emotional OE	3.64	0.68	3.33	0.64	3.81	0.65	- 0.49	-5.60***	-0.75
Sensual OE	3.37	0.68	3.11	0.69	3.52	0.63	- 0.41	-4.66***	-0.63
Psychomotor OE	3.12	0.67	3.27	0.69	3.04	0.64	0.23	2.57*	0.35

***$p < .001$, **$p < .01$, *$p < .05$.

Note. Cohen *d* is calculated to show three levels of effect size thresholds when interpreting the effect of intervention: Small-S (.20), Medium-M (.50), Large-L (.80), and Very Large-VL (1.30) (Cohen, 1988).

The mean OEs were compared using the independent t-test. Table 4.16 shows that there were statistically significant differences in emotional OE [$t(238) = -5.60$, $p < .001$] and sensual OE [$t(238) = -4.66$, $p < .001$] in favor of females, with moderate Cohen's effect sizes ($d = -0.75, -0.63$) indicating the differences have moderate practical significance. The findings also revealed statistically significant differences in favor of males for psychomotor OE [$t(238) = 2.57$, $p < .05$] with moderate effect size ($d = 0.35$). No statistically significant differences were found in intellectual and imaginational OE.

Descriptive statistics were also employed to report the ADHD profile of 240 high school students: 86 males and 154 females. ADHD inattention subscale scores were higher for females than males, while the opposite was true for the hyperactivity-impulsivity subscale and Conners index. None of the differences summarized in Table 18 were statistically significant.

Table 18

Mean differences in ADHD subscales

	All (N = 240)		Males (N = 86)		Females (N = 154)		Mean Difference	t-test	Cohen's d
	M	SD	M	SD	M	SD			
Inattention ADHD	1.13	0.58	1.10	0.55	1.15	0.60	-0.05	-0.59	-0.08
Hyp_Imp ADHD	0.98	0.52	1.01	0.51	0.97	0.53	0.04	0.60	0.08
Conners Index	0.97	0.53	0.98	0.49	0.96	0.55	0.02	0.22	0.03

***$p < .001$, **$p < .01$, *$p < .05$.

Note. Cohen *d* is calculated to show three levels of effect size thresholds when interpreting the effect of intervention: Small-S (.20), Medium-M (.50), Large-L (.80), and Very Large-VL (1.30) (Cohen, 1988).

CHAPTER 5

DISCUSSION

In this chapter, results pertaining to each of the research questions are summarized and discussed in light of the available literature. Implications, limitations, and future recommendations are presented.

Summary of Descriptive Results

A total of 154 females and 86 males ranging in age between 15 and 19 years old completed the questionnaire. The response rate to the questionnaire was 23.8% whereas the completed response rate was 15.9%. The sample was found to be highest in intellectual and emotional OEs followed by sensual, psychomotor, and imaginational OEs. The sample was found to be highest in everyday creativity followed by scholarly creativity, artistic creativity, scientific creativity, and lastly performance creativity.

The Role of Demographics, OEs, and ADHD in Predicting Creativity

The first research question in this study was: what are the roles of Lebanese high-school students' gender, five forms of OEs, and three subscales of ADHD in predicting five domains of creativity? The role of demographics, OEs, and ADHD in predicting each of the creativity subscales was evaluated using hierarchical multiple regression.

In summary, demographic variables did not show a notable contribution to the variance in creativity subscales, except for the notable contribution of gender in predicting artistic creativity. The overexcitabilities had a notable contribution to the variance in each of the creativity subscales. Their highest contribution was to scholarly creativity, followed by everyday creativity, artistic creativity, performance creativity, and last and least noteworthy, scientific creativity. Generally, all the OEs were considered in the regression model apart from imaginational OE, which was excluded in studying the relationship with everyday

creativity, and imaginational, emotional, and sensual OEs, which were excluded in studying the relationship with scientific OE. Among the five OEs, intellectual OE was the most significant predictor for 3 out of the 5 creativity subscales: scholarly, everyday, and scientific creativity. Sensual OE was the most significant predictor of artistic creativity and performance creativity. No significant correlations between ADHD and creativity subscales were found. Only inattention was a noteworthy predictor of everyday creativity with a negative correlation to the subscale. Otherwise, the ADHD subscales showed no notable contribution to the model.

Demographics and Creativity

The demographics included in this analysis were age and gender. Only gender contributed to the prediction of artistic creativity in favor of females. The results pertaining to gender are in line with literature in which general trends reveal relative equality among males and females when it comes to creativity (Baer & Kaufman, 2008). The inconsistency in this study is specific to artistic creativity, which could be explained by cultural factors. It could be that young men in Lebanese culture, more so in this age group, are less encouraged to pursue artistic endeavors than their female counterparts. It could also be that art is perceived by young boys as contradictory to the image of a "strong" or "tough" man and therefore they are less likely to pursue it to conform to cultural norms. In reviewing research regarding gender and creativity, Warren et al. (2018) conclude that creativity may be subject to expectations and cultural biases. Kaufman (2006) has found that boys tend to rate themselves higher in science domains while girls tend to rate themselves higher in artistic domains. Interestingly, only artistic creativity seems potentially subject to cultural biases in this study but not scientific ones. It could be that such cultural bias regarding science is less prominent across this sample. Research in the Arab world has shown that both genders have positive attitudes

toward science (Khishfe & Abou Jaoude, 2016). Sarouphim and Chartouny (2017) have also found that boys and girls in Lebanon did not show any differences in attitude or achievement towards math disputing the idea that female students in traditional cultures perform worse or dislike the field.

Overexcitabilities and creativity

While the combinations of OEs notably predicted different domains of creativity in this study, intellectual and sensual OEs were the most notable predictors. These results are not in line with Dabrowski's (1967) initial theory in which he postulated that intellectual, emotional, and imaginational OEs were the richer forms of OEs. Several studies have shown that these OEs are higher in the gifted (Gallagher, 1985; Piechowski & Colangelo, 1984; Piechowski et al., 1985; Silverman & Ellsworth, 1981), with intellectual and imaginational OEs being the hallmark of creativity (Martowska & Romanowics, 2020). Nevertheless, the results of this study are partially consistent with the literature. He et al (2017) found a positive correlation between the OEs and creativity. In their study, OEs explained 18.6% of the variance of the creativity score. However, they found that imaginational OE was the most significant predictor of creativity. Al-Shayab and Al-Khatib (2015) also found that all OEs correlated positively with creativity. Al Suleiman (2014) found that intellectual OE positively correlated with academic achievement while sensual OE correlated with originality and creativity.

Overall, the finding that intellectual OE was a major predictor of scholarly, every day, and scientific creativity seems consistent with what we know so far. Intellectual OE is higher in creative than in non-creative individuals (Schiever 1985; Yakamci-Guzel & Akarsu, 2006). Intellectual OE is also higher in individuals identified as gifted based on intellectual ability and academic achievement (Winkler & Voight, 2016). Baer and Kaufman (2005) postulate

that there is a positive correlation between creativity and intelligence. Intelligence is viewed as a prerequisite for creativity, with higher levels of intelligence needed for mathematical creativity in comparison with artistic creativity. It follows that higher levels of intelligence are most likely more needed for scientific and scholarly creativity in comparison with other types. Silverman (2013) also believes that intellectual OE overlaps with intellect. Examining the items on KDOCS that constitute the scholarly, everyday, and scientific creativity scales, one sees that they involve cognitive and metacognitive skills such as problem-solving and self-awareness and academic skills such as writing, debating, designing a scientific experiment, or solving math problems. These abilities are also reflected in Daniels and Piechowski's (2010) description of intellectual OE manifesting in creative problem-solving, metacognition, and a higher capacity for sustained intellectual effort. These descriptions may explain the large contribution of intellectual OE in the prediction of forms of creativity that likely require higher levels of intellect as prerequisites.

The intensity of sensual OEs for creative individuals and a correlation between the two constructs has also appeared in the literature (Martowska et al., 2020; Al Suleiman, 2014). In this study, sensual OEs were found to be predictive of artistic and performance creativity. Examining the items on KDOCs pertaining to these two subscales, one sees that the items reflect an affinity to create or appreciate art. In Daniel and Piechowski's (2010) description of individuals with high sensual OEs, the authors claim that such individuals have enhanced pleasures of the senses and enhanced aesthetic appreciation as if they are looking at the world through different lenses. They refer to artists' reflections on the intensity of their perception. Matrowska et al. (2020) believe that such sensitivity to subtle stimuli may lead to a stronger need for artistic expression. These descriptions may explain the large contribution of sensual OEs to the prediction of artistic and performance creativity.

It is noteworthy that imaginational and emotional OEs were missing as significant contributors in this study. The difference in findings could potentially be a result of the use of a stepwise regression in the later stages of the analysis, the use of a different measure of creativity as KDOCS has not been previously used in the creativity-OE research or the age of the participants. He et al (2017) used a forward selection procedure in the second stage of hierarchical multiple regression analysis while a stepwise selection procedure was used in this study. Several of the studies in which imaginational and emotional OEs were found to be higher in the creative groups defined creativity based on the teacher as opposed to self-perception (Yakmaci-Guzel & Akarsu, 2006) or serious involvement in an artistic profession or field of study (Martowska et al., 2018; Moon & Montgomery, 2005; Piechowski & Colangelo, 1984; Piechowski et al., 1985; Piirto et al., 1996) which may be indicative of Pro C creativity. The participants in several of these studies were adults (Martowska et al., 2018; Moon & Montgomery, 2005; Piechowski & Colangelo, 1984; Piechowski et al., 1985).

ADHD and creativity

Only inattention was a noteworthy negative predictor of everyday creativity in this study. Even though these findings are consistent with some studies that show that children with ADHD perform worse on some tasks than their typical peers (Abraham et al., 2006; Aliabadi et al., 2016; Healey & Rucklidge, 2005), they are still surprising. Paek et al (2016) explain the inconsistency in studies attempting to understand the relationship between creativity and different forms of psychopathology including ADHD by the inconsistency of other factors like demographic variables, intelligence, and assessment. They conclude that generally, the relationship is weak between creativity and psychopathology, however, is stronger when psychopathology is subclinical and self-assessment measures of creativity are used. Even though no clinical diagnosis of ADHD was made in this study and creativity was

measured using self-assessment as opposed to performance, ADHD subscales still failed to show a noteworthy positive contribution in the variance of creativity. However, it is noteworthy to mention that no previous study investigated the relationship between ADHD and creativity where creativity was measured using the KDOCS making it more challenging to position these results in the literature but extending it by adding the KDOCS to the list of tools used in the creativity-ADHD research.

Relationship between OEs and ADHD

The second research question in this study was: What is the relationship between the five forms of OEs and ADHD scales among Lebanese high-school students? A Canonical correlation analysis was conducted to understand this relationship. The analysis showed that the two constructs share 47% of the variance, which is supportive of the expected theoretical relationship between OEs and ADHD. Specific findings reveal that imaginational and emotional OEs are the most relevant contributors to the synthetic variable (Function 1) followed by psychomotor and intellectual OE (Function 2). Imaginational and emotional OEs are positively correlated to the three ADHD subscales while psychomotor and intellectual OE are positively correlated to the hyperactive-impulsive subscale. This means that students with high emotional and imaginational OEs may display behaviors that could be confounded with those of students with ADHD, and those with high psychomotor and intellectual OEs may display behaviors that can be confounded with ADHD hyperactive-impulsive presentation. The Pearson correlation coefficients also support these conclusions as moderate ($r > .30$) significant correlations were found between psychomotor OE and hyperactive-impulsive ADHD subscale, emotional OE and inattention, and imaginational OE and all of the ADHD subscales. Small significant correlations ($r < .30$) were found between each of emotional OE and intellectual OE with hyperactivity-impulsivity and Conners index. The findings of the

CCA are in line with the results of Al-Hroub and Krayem's (2020) study in which they found that imaginational OE was the most relevant contributor to the synthetic variable followed by psychomotor and intellectual OEs. The three OEs correlated with ADHD hyperactive-impulsive subscale and imaginational OE also correlated with inattention. The only OE present in this study's findings but missing from theirs is emotional OE. Rinn and Reynolds (2012) also found that psychomotor OE correlates with hyperactivity-impulsivity, sensual OE with Conners ADHD index, and imaginational OE with the three subscales. The findings of this study support and add to previous findings that students with high levels of imagination, thinking skills, and emotional intensity may display excessive physical energy and mental activity that should not be confused with hyperactivity and inattention. This is in line with the view that children with high overexcitabilities may be misdiagnosed with ADHD in the absence of a comprehensive assessment (Al-Hroub & Krayem, 2020). The CCA revealed similar patterns when the relationship was studied by gender. The constructs shared 47% of the variance for males and 51.5% of the variance for females. Imaginational and emotional OEs were the main contributors to the synthetic variable (Function 1) for females. They positively correlated with inattention, hyperactivity-impulsivity, and Conners ADHD index. The same OEs, in addition to psychomotor OE, were the main contributors to the synthetic variable (Function 1) for males and correlated positively to the three ADHD subscales as well. When it comes to Function 2, psychomotor and intellectual OEs were the most significant predictors however they correlated positively with the ADHD hyperactive-impulsive subscale for females and negatively with the inattention subscale for males. This could mean that girls with high psychomotor and intellectual OEs may show impulsive behavior while boys may show vigilance and attention.

The tools commonly used to measure ADHD and OEs may explain the overlap in the two constructs found in this and the other studies. Looking closely at items related to the hyperactivity-impulsivity presentation of ADHD, one finds statements like "I am restless" and "I have too much energy to stay still". In the OEQII, examples of items related to psychomotor OE are "The more I have to sit still, the more restless I get" and "I feel like my body is constantly in motion". The behavioral perspective adopted in investigating this overlap may contribute to these findings; however, this conclusion cannot be made with confidence as one cannot necessarily make the same observations about the other correlating subscales.

Nevertheless, the results of this analysis shed the light on the overlap between the constructs of ADHD and OEs for males and females in Lebanese high schools. Teachers play an important role in students' diagnoses (El-Khoury & Al-Hroub, 2018), and therefore lack of knowledge about OEs and the classification of expressions of OEs as pathology poses risk to inappropriate interpretation and treatment of behavior (Harnett et al., 2014). Teachers could lack knowledge about both OEs and ADHD. In a study in Lebanon by Berri and Al-Hroub (2016), the authors concluded that teachers in Lebanon have misconceptions and gaps in their knowledge about ADHD. Al-Hroub and Krayem (2018) have also shown that teachers in Jordan have gaps in their knowledge of ADHD and do not lack knowledge of OEs and thus it would be difficult for them to distinguish between the two.

Gender Differences in OEs and ADHD

The third research question in this study was: What are the gender differences in OE and ADHD levels among Lebanese high-school students? An independent *t*-test was utilized to answer that question. The findings in this study revealed statistically significant differences in OEs between boys and girls. Females showed higher emotional and sensual OEs while

males showed higher psychomotor OEs. As for ADHD, no significant differences were found between genders.

Findings relevant to OEs are consistent with several studies in the literature (Tieso, 2007a; Van den Broeck et al., 2014) and inconsistent with others that show that males have higher intellectual OE (Siu, 2010; Tieso, 2007b). Bouchet and Falk (2001) have argued that gender differences in overexcitabilities can be reflective of traditional gender-role expectations. Males and females tend to express or inhibit emotions and responses based on perceived gender appropriateness, as implicitly or explicitly learned from family, peers, school, and media (Bouchet and Falk, 2001). Gender identity seems to be crucial in the expression of OEs. Miller at al. (2009) argued that gender identity has a stronger correlation with OEs in comparison to sex. They concluded that masculinity is correlated with intellectual and psychomotor OEs while femininity is correlated with emotional and sensual OE. Although this study did not account for gender identity given the sensitivity of the topic in Lebanon, the results still seem to conform to the cultural norms in Lebanon and how each of the genders is socialized. Teachers in Lebanon are more tolerant of psychomotor or hyperactive behaviors in boys than in girls (Berri & Al-Hroub, 2016). Culturally, it is also more appropriate for girls to express sensuality and emotions than boys.

Findings relevant to ADHD are surprising but also offer insight into gender differences in ADHD. While the literature reports a higher incidence of ADHD in males than females (Slobodin & Davidovitch, 2019), the results of this study show no statistically significant differences in ADHD subscales between males and females. This lack of gender differences could be explained by the self-reporting nature of the tool used combined with what is known as the referral bias. Generally, research has shown that male-to-female ratios of ADHD are higher in clinical versus subclinical populations (Slobodin & Davidovitch,

2019). Diagnosed boys often show more hyperactive impulsive behavior while diagnosed girls show more inattentive behavior. The externalized behavior of boys versus the internalized behavior of girls that is less disruptive to the classroom results in teachers being more likely to refer boys than girls to an ADHD evaluation (Biederman et al., 2005). Researchers have shown that such subjective measures of behavior result in gender differences while boys and girls do not show differences when objective measures of ADHD are used (Slobodin & Davidovitch, 2019). Biederman et al. (2005) have found no gender differences in non-referred children and have concluded that their results confirm the clinical suspicion that gender differences may be a result of referral bias. Because the participants in this study self-reported the symptoms of ADHD, girls' symptoms' may have had a similar likelihood of being expressed to boys' symptoms resulting in no significant gender differences.

Limitations and Future Recommendations

The results of these studies must be interpreted in light of the limitations. The first limitation of the study pertains to the selected sample and the data collection method. The sample in this study was quite homogeneous in the sense that all of the students were from private schools in the South of Lebanon and the age range was limited. Future research expanding to more geographic areas in Lebanon is encouraged encompassing students in both private and public schools as well as a wider age group. Additionally, the collection of data was conducted during a lockdown due to the Covid-19 pandemic in the absence of proper infrastructure in Lebanese schools and households to resume activities online. Limitations forced the collection of data to be planned for one session, which might have led students to experience fatigue and discontinue filling out the responses. The data was also collected

online, which limits its quality. In-person data collection divided across multiple sessions is recommended for a similar future study.

The second limitation of this study is the choice of tools, particularly the creativity measure as the use of The Conners 3rd Edition Self-Report Scale and OEQII can be better defended. ADHD was measured using The Conners 3rd Edition Self-Report Scale, which was designed to be administered as part of a multi-informant assessment procedure in which three scales are to be filled by each parent, teacher, and student being assessed (Kao & Thomas, 2018). For diagnostic purposes, it is to be used in combination with other psychometric measures, interviews, and clinical observations (Kao & Thomas, 2018). Nevertheless, the use of the self-report scale in this study can be defended on the basis that it is not intended to be used as a diagnostic tool. Additionally, the self-report scale provides information about how the student behaves in different settings thus providing a relatively comprehensive source of information. The *Conners 3rd Edition Self-Report Scale* is also based on the DSM, which has been criticized by some researchers as a culturally inappropriate tool. The DSM is viewed as a tool developed based on Western ideals and thus may not be universally applicable (Shehab & Al-Hroub, 2019). Nevertheless, it remains one of the clearest diagnostic systems available (Shehab & Al-Hroub, 2019).

As for the Overexcitability Questionnaire-II (OEQ-II), its use can be questioned on a theoretical basis in how it reflects overexcitabilities as they first appeared in Dabrowski's theory of positive disintegration. In Mendaglio et al. (2019), Sal Mendaglio cautions researchers that the questionnaires being used in research do not accurately reflect the complexity of Dabrowski's view and do not fully capture his definition and description of overexcitabilities. Mendaglio (2012) also warns against treating OEs as continuous variables,

which may be acceptable for analytic purposes, but inconsistent with Dabrowski's theory. That said, the OEQII has been used by many researchers in the field in different contexts such as in different nations, with different age groups, and with sexually diverse populations (Warne, 2011).

Creativity was measured using a self-efficacy tool as opposed to a performance-based measure. The Kaufman Domain of Creativity Scale (K-DOCS) is a self-report measure of perceived creativity (Kaufman, 2012). Even though researchers have found evidence for the reliability and construct, discriminant, and convergent validity of K-DOCS (Alikandemir & Kaufman, 2019; McKay et al., 2017), generally, creativity self-assessment tools should not be used as a proper substitute for performance-based or other objective measures of creativity (Kaufman, 2019). That is because people may report high creativity out of social desirability (Kaufman, 2019) or as a result of unusually high self-esteem (Kaufman, 2012). Nevertheless, researchers still sometimes use such tools strictly for practical reasons, when there are not enough time, money, or resources to administer performance based-measures, in which case, the stance is defendable (Kaufman, 2019), particularly in situations where high-stakes for the participants are not involved (Silvia et al., 2012) as is the case in this study. Given that this study provided empirical evidence of the contribution of OEs in predicting creativity, future studies in Lebanon utilizing a performance-based measure of creativity like TTCT are recommended.

The third limitation of this study is the adoption of a behavioral perspective in investigating overexcitabilities and ADHD. The overexcitabilities have been described from a biological perspective as a central property of the nervous system (Mendaglio & Tiller, 2006) and a cognitive perspective as a type of mental functioning that is associated with enhanced

information processing (Daniels & Piechowski, 2009). Kuo et al. (2012) have studied the OEs from a neurological perspective. They used voxel-based morphometry of statistical parametric mapping on MRI scans and found positive and negative correlations between the different OEs and gray matter volume in several parts of the brain (Kuo et al., 2012). These methods have also been used in the study of ADHD and have revealed a reduction in gray matter in areas of the brain involved in decision-making, motivation, cognitive control, and motor functioning (Bralten et al., 2016; Carmona et al., 2005). A future line of research may extend beyond the current studies examining the overlap between ADHD and OEs by examining similarities or differences from a neurological perspective.

Conclusion

Despite the limitations of this study, it makes a substantial contribution to the literature being the first to investigate the relationship between OEs, ADHD, and creativity in Lebanon. It extends the existing research in other parts of the world by adopting a domain-specific definition of creativity. It provides empirical evidence to Dabrowski's theory verifying the contribution of OEs in predicting creativity. It also shows that there exists an overlap between the expressions of OEs and ADHD symptoms. An additional interesting observation in this study is that even though the CCA showed an overlap between ADHD and OEs, the hierarchical multiple regression showed a generally notable contribution of OEs only in predicting creativity, but not ADHD. This may suggest that these two constructs are separate constructs however their symptomologies or expressions overlap. Such overlap, without the proper knowledge to distinguish between the two, could lead to the mislabeling of students and the quelching of developmentally appropriate behaviors. It could be particularly problematic when such behaviors are negatively labeled while OEs hold a positive connotation associated with creativity. When teachers view the expression of OEs as signs of

pathology, particularly ADHD, the negative label becomes the lens through which all behavior is interpreted and according to which inappropriate treatment is given (Hartnett et al., 2004). In practice, completely quieting children's expression of OEs can damage rather than enhance their creative and overall development (Daniels & Piechowski, 2010) particularly when we consider Dabrowski's theory that argues that developmental potential is predicted by the strength of the overexcitabilities. Teacher and counselor training programs in Lebanon should consider introducing OEs, both in general and special education programs. Teachers should integrate the intensity of OEs with the daily confines of the classroom and help children modulate the expression of this intensity based on the circumstances so they can foster creativity (Daniels & Piechwoski, 2010). One thing teachers can do is discuss the positive aspects of the students' OEs (Daniels & Piechowski, 2010). Another thing they can do is to facilitate the expression of each of the OEs (Daniels & Piechowski, 2010). For example, for students with high intellectual OEs, teachers can teach inquiry methods, allow students to develop projects based on personal interests, provide opportunities for students to engage with intellectual peers as opposed to age-peers only, and encourage self-reflection. For students with sensual OEs, the teacher could engage with the child to co-create environments that are pleasing, comfortable and allow them to dwell on the delight brought by their senses while limiting offensive stimuli. For children with psychomotor OEs, teachers can accommodate their need to release energy by providing activities that require physical movement while also teaching relaxation techniques. For children with imaginational OEs, teachers are encouraged to provide outlets for creative pursuits such as writing or drawing or dancing and to allow children the space to share their imagination and the time to work on projects that foster design and invention. For children with emotional OEs, teachers are encouraged to teach children positive ways of emotional expression and self-regulation

(Daniels & Piechowski, 2010). This study also shows that it is important that practitioners are brought to recognize the value of a rigorous and thorough ADHD evaluation process, to avoid mislabeling children. Third, the results of this study also show how cultural norms and gender socialization impact the expression of OEs. Practitioners need to be often reminded to reflect on their perceptions and how their views of the world affect the way they interact with and what they tolerate from students of different genders in the classroom. Fourth, the results of this study also shed the light on gender differences in ADHD. Researchers should continue to explore those differences in the Lebanese population and better understand whether prevalence differences reflect real differences between genders or whether they are a result of different biases.

This study was the first exploratory study in Lebanon attempting to investigate the relationship between ADHD, OEs, and creativity. Further research spanning larger and more heterogeneous samples from various areas of Lebanon is encouraged to better understand this relationship in the Lebanese population.

APPENDIX A

Overexcitability Questionnaire II

Directions: Please rate how much each statement fits you. Respond on the basis of what you are like now, not how you would like to be or how you think you should be. Circle the number under the statement that most accurately reflects the way you see yourself.

		Not at All Like Me	Not Much Like Me	Some-what Like Me	A Lot Like Me	Very Much Like Me
1.	I like to daydream…….	1	2	3	4	5
2.	I am a competitive person…….	1	2	3	4	5
3.	The varieties of sound and color are delightful……	1	2	3	4	5
4.	My pretend world is very real to me…….	1	2	3	4	5
5.	I am an independent thinker……..	1	2	3	4	5
6.	I feel other people's feelings…….	1	2	3	4	5
7.	If an activity is physically exhausting, I find it satisfying…….....	1	2	3	4	5
8.	Viewing art is a totally absorbing experience……..	1	2	3	4	5
9.	I worry a lot……...	1	2	3	4	5
10.	I love to be in motion……	1	2	3	4	5

11.	It makes me sad to see a lonely person in a group…	1	2	3	4	5
12.	I can take difficult concepts and translate them into something more understandable……...	1	2	3	4	5
13.	I get great joy from the artwork of others…….	1	2	3	4	5
14.	When I get bored, I begin to daydream…….	1	2	3	4	5
15.	When I have a lot of energy, I want to do something really physical…….	1	2	3	4	5
16.	I question everything – how things work, what things mean, why things are the way they are……..	1	2	3	4	5
17.	I can be so happy that I want to laugh and cry at the same time……..	1	2	3	4	5
18.	I am more energetic than people my age……..	1	2	3	4	5
19.	I can for a new concept by putting together a number of different things……	1	2	3	4	5
20.	Sometimes I pretend I am someone else……...	1	2	3	4	5
21.	The more that I have to sit still, the more restless I get……..	1	2	3	4	5
22.	Things that I picture in my mind are so vivid that they seem real to me…….	1	2	3	4	5
23.	I observe and analyse everything……..	1	2	3	4	5
24.	I find myself mixing truth and fantasy in my thoughts…….	1	2	3	4	5

25.	Theories get my mind going…….	1	2	3	4	5
		Not at All Like Me	Not Much Like Me	Some-what Like Me	A Lot Like Me	Very Much Like Me
26.	I have strong feelings of joy, anger, excitement and despair……...	1	2	3	4	5
27.	I feel music throughout my whole body……...	1	2	3	4	5
28.	I enjoy exaggerating reality……..	1	2	3	4	5
29.	I feel like my body is constantly in motion……..	1	2	3	4	5
30.	I love to solve problems and develop new concepts.	1	2	3	4	5
31.	I am deeply concerned about others……..	1	2	3	4	5
32.	I delight in colors, shapes, and textures of things more than other people do…….	1	2	3	4	5
33.	I believe that dolls, stuffed animals, or the characters in books are alive and have feelings……	1	2	3	4	5
34.	Words and sounds create unusual images in my mind……..	1	2	3	4	5
35.	My strong emotions move me to tears……..	1	2	3	4	5

36.	I like to dig beneath the surface of issues…….	1	2	3	4	5
37.	I am moved by beauty in nature……	1	2	3	4	5
38.	I am not sensitive to the color, shape, and texture of things like some people are……...	1	2	3	4	5
39.	When I am nervous, I need to do something physical…….	1	2	3	4	5
40.	I try to analyse my thoughts and actions……...	1	2	3	4	5
41.	I can feel a mixture of different emotions all at once……...	1	2	3	4	5
42.	I am the type of person who has to be active – walking, cleaning, organizing, doing something…..	1	2	3	4	5
43.	I like to play with ideas and try to think about how to put them to use……..	1	2	3	4	5
44.	I am an unemotional person……..	1	2	3	4	5
45.	I enjoy the sensations of colors, shapes, and designs……...	1	2	3	4	5
46.	The difference in aromas is interesting…….	1	2	3	4	5
47.	I have a talent for fantasy……..	1	2	3	4	5
48.	I love to listen to the sounds of nature……..	1	2	3	4	5
49.	I take everything to heart……..	1	2	3	4	5
50.	I thrive on intense physical activity, e.g. fast games and sports……..	1	2	3	4	5

Scoring Procedure

To get a total score for each OE, 10 items are summed. Some items require reverse scoring where 1 becomes 5 and 5 becomes 1, 2 becomes 4 and 4 becomes 2, and 3 does not change. Of the original 21 reverse-scored items, only 2 remain in the final version of the OEQII. The total score of each OE is divided by 10, the total number of questions, to maintain the scale of 1 to 5.

Compute the scores as follows:

The Psychomotor OE score is obtained by (a) adding items 2, 7, 10, 15, 18, 21, 29, 39, 42, 50; and (b) dividing by 10.

The Sensual OE score is obtained by (a) reverse scoring item 38; (b) adding items 3, 8, 13, 27, 32, 37, 38, 45, 46, 48; and (c) dividing by 10.

The Imaginational OE score is obtained by (a) adding items 1, 4, 14, 20, 22, 24, 28, 33, 34, 47; and (b) dividing by 10.

The Intellectual OE score is obtained by (a) adding items 5, 12, 16, 19, 23, 25, 30, 36, 40, 43; and (b) dividing by 10.

The Emotional OE score is obtained by (a) reverse scoring item 44; (b) adding items 6, 9, 11, 17, 26, 31, 35, 41, 44, 49; and (c) dividing by 10.

APPENDIX B

Modified Kaufman Domains of Creativity Scale (K-DOCS)

Instructions: Compared to people of approximately your age and life experience, how *creative* would you rate yourself for each of the following acts? For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks.

1 = Much less creative

2 = Less creative

3 = Neither more nor less creative

4 = More creative

5 = Much more creative

1. Finding something fun to do when I have no money _____
2. Helping other people cope with a difficult situation _____
3. Teaching someone how to do something _____
4. *Maintaining a good balance between my school-work and my personal life _____
5. Understanding how to make myself happy _____
6. Being able to work through my personal problems in a healthy way _____
7. Thinking of new ways to help people _____
8. Choosing the best solution to a problem _____
9. Planning a trip or event with friends that meets everyone's needs _____
10. Mediating a dispute or argument between two friends _____
11. Getting people to feel relaxed and at ease _____
12. *Writing a non-fiction article for a language class assignment _____
13. *Writing a formal letter to apply to a summer job/scholarship/university_____

14. Researching a topic using many different types of sources that may not be readily apparent _____
15. Debating a controversial topic from my own perspective _____
16. Responding to an issue in a context-appropriate way _____
17. Gathering the best possible assortment of articles or papers to support a specific point of view _____
18. Arguing a side in a debate that I do not personally agree with _____
19. Analyzing the themes in a good book _____
20. *Figuring out how to integrate critiques and suggestions while revising a written assignment _____
21. *Being able to offer constructive feedback based on my own reading of a friend's written assignment _____
22. Coming up with a new way to think about an old debate _____
23. Writing a poem _____
24. Making up lyrics to a funny song _____
25. Making up rhymes _____
26. Composing an original song _____
27. Learning how to play a musical instrument _____
28. Shooting a fun video to air on YouTube _____
29. Singing in harmony _____
30. Spontaneously creating lyrics to a rap song _____
31. Playing music in public _____
32. Acting in a play _____
33. Carving something out of wood or similar material _____

34. Figuring out how to fix a frozen or buggy computer _____
35. Writing a computer program _____
36. Solving math puzzles _____
37. Taking apart machines and figuring out how they work _____
38. Building something mechanical (like a robot) _____
39. Helping to carry out or design a scientific experiment _____
40. Solving an algebraic or geometric proof _____
41. Constructing something out of metal, stone, or similar material _____
42. Drawing a picture of something I've never actually seen (like an alien) _____
43. Sketching a person or object _____
44. Doodling/Drawing random or geometric designs _____
45. Making a scrapbook page out of my photographs _____
46. Taking a well-composed photograph using an interesting angle or approach _____
47. Making a sculpture or piece of pottery _____
48. Appreciating a beautiful painting _____
49. Coming up with my own interpretation of a classic work of art _____
50. Enjoying an art museum _____

*Items that have been modified

Originally, these items were the following:

4. Maintaining a good balance between my work and my personal life

12. Writing a non-fiction article for a newspaper, newsletter, or magazine

13. Writing a formal letter to apply to the editor

20. Figuring out how to integrate critiques and suggestions while revising a work

21. Being able to offer constructive feedback based on my own reading of a paper

Brief Description: The *Kaufman Domains of Creativity Scale (K-DOCS*) is designed to measure self-perceived creativity across different domains. It is a 50 item measure that results in five self-reported scores for everyday, scholarly, performance, scientific, and artistic creativity. Usage is free; citations and scoring for the scale is below.

Scoring: All items should be randomized. The scale is designed to show perceived creative strengths (and weaknesses) and scores should be compared within the sample collected. Although possible, summing the factors for a global score is not encouraged.

Items 1-11 comprise Factor 1, *Everyday Creativity*

Items 12-22 comprise Factor 2, *Scholarly Creativity*

Items 23-32 comprise Factor 3, *Performance Creativity*

Items 33 -41 comprise Factor 4, *Scientific Creativity*

Items 42-50 comprise Factor 5, *Artistic Creativity*

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