DIFFERENTIATION OF AUTISM SPECTRUM DISORDER SYMPTOMS
FROM OTHER PERSONALITY TRAITS AND STYLES

by

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Differentiation of Autism Spectrum Disorder Symptoms From Other Personality Traits and Styles

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**ABSTRACT**

The *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; American Psychiatric Association, 2013) combined all previous autism diagnoses into a single diagnostic category, autism spectrum disorder (ASD). One critical issue with the *DSM-5* ASD symptoms is that they overlap with behaviors consistent with introversion, a non-pathological tendency to be introspective, and the symptoms of schizoid personality disorder. The purpose of the present study was to determine whether an 84-item measure of the ASD *DSM-5* criteria (Coolidge Autism Symptom Survey; CASS) could differentiate among extroverted and introverted children who were developing typically (DT), children with a diagnosis of schizoid personality disorder, and children diagnosed with mild, moderate, and severe levels of ASD. One-hundred forty-nine participants were recruited from University of Colorado, Colorado Springs undergraduate classes. Each respondent was asked to fill out the CASS about a child they knew, who matched one of these diagnoses, between the ages of 5-17 years old. Unfortunately, no children were found to meet the schizoid personality disorder criterion. It was found that there were no differences in overall CASS sums between extroverted DT and introverted DT children. However, as hypothesized both of those groups scored significantly lower on the CASS than children with mild ASD, moderate ASD, and severe ASD. The CASS scores on the latter two groups were not significantly different. Preliminary psychometric analyses of
the CASS support the two *DSM-5* criteria categories (Deficits in Communication/Social Interactions and Restrictive/Repetitive Behaviors), and they support the preliminary reliability and validity of the CASS.

*Keywords:* autism spectrum disorder, ASD, introversion, *DSM-5*, Coolidge Autistic Symptom Survey, CASS
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CHAPTER I
INTRODUCTION

In Sula Wolff’s book, Loners: The Path of an Unusual Child (1995), the lives of introverted, schizoid, and autistic children are examined, and their development followed into adulthood. Wolff teased out the minute differences between these disorders, and by doing so helped clarify the differential diagnoses between those children who were simply introverted, and those who were schizoid or autistic. Wolff defined schizoid children as differing from those with autism in that they were less handicapped when it came to total functioning, and their early childhood development was not as severely delayed. In addition, Wolff found that those children with schizoid personality traits related better to others than children with autism, especially their parents, had fewer speaking difficulties, and a higher intelligence than those children diagnosed with autism.

The purpose of the present study is to expand upon the differentiation between these three groups of children.

A Brief History of the Diagnosis of Autism

In 1911, Eugen Bleuler first developed the concept of autism, and he used the term autism to describe a symptom of schizophrenia. According to Bleuler, autistic thinking was characteristic of an inner world created by children to escape reality (Bleuler, 1951). These fantasies represented an “inner life” which was unobservable by others. However, this definition was challenged in the 1960s, and by the 1970s developed an entirely new connotation, such as a child who lacks imagination, rather than a child
with excess imagination and fantasies (Zeldovich, 2018). Leo Kanner, an Austrian-American psychiatrist, was one of the first members of the psychological community to relate autism to “aloneness,” and defined it closer to contemporary definitions of autism, writing in 1958 about “extreme autistic aloneness,” echolalia, and perseveration (Eisenberg & Kanner, 1988). Eisenberg and Kanner believed that the 11 children in their study demonstrated clinical features unique from other behavioral disturbances, and later this unique syndrome would later be labeled “early infantile autism” (Eisenberg & Kanner, 1988).

The first *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association), published in 1952, did not contain an official diagnosis for autism. However, it did note that psychotic disorders in childhood “manifesting primarily as autism” (p. 28) should be classified as a form of childhood schizophrenia. Ironically, this *DSM* provided no definition for their use of the word *autism*. At this time, it appears that autism was thought to develop much along the same course as schizophrenia and that autism might have been caused by ‘cold’ or ‘refrigerator’ mothers. The idea that autism was caused by environmental, rather than genetic factors was popularized by Austrian-born, self-proclaimed psychologist Bruno Bettelheim, who started an institution for children labeled as autistic, where they received what was referred to as a ‘parentectomy’ (Durban & Mandas, 2013). In other words, Bettelheim believed that autistic children would benefit from being removed by their aloof parents.

In 1968, the publication of the *DSM-II* again failed to define autism. Once more, the word “autism” fell under the description of “Schizophrenia, Child type.” During this time, fascination around autism grew, and Kanner’s previous writings peaked in
popularity. Research at the time showed autism had a biological basis, and Bettelheim’s theory of refrigerator mothers fell into disfavor. Rutter (1978) endorsed Kanner’s original definition of autism, and he added clear diagnostic symptoms to the original definition of autism.

In *DSM-III* (1980), autism was labeled infantile autism, and was classified as a developmental disorder with a separate diagnosis from schizophrenia. The *DSM-III* presented six major symptoms for infantile autism. They included onset within the first 30 months of life, a lack of responsiveness to others, gross deficits in language, peculiar speech patterns, bizarre responses to the environment (e.g., resistance to minor changes in the environment), and an absence of delusions or hallucinations. Further, infantile autism was classified into two separate diagnoses; infantile autism with the full syndrome present, and infantile autism, residual state (where the full syndrome of symptoms was no longer present). This was the first time the psychological community saw a continuum for autism severity.

With the publication of *DSM-III-R* (1987), the diagnosis of infantile autism was changed to autistic disorder. This edition of the *DSM* also introduced “pervasive developmental disorder not otherwise specified (NOS)” for those who did not meet full autism criterion. In order to receive a diagnosis of infantile autism, a child must have met eight of the 16 symptoms listed, including two items from criteria A, one from criteria B, and one from criteria C. Criteria A lists symptoms consistent with impairment in social interactions, such as; (1) lack of awareness of the feeling and emotions of others, (2) abnormally seeking, or not seeking comfort during times of distress, (3) lack of or impaired imitation, (4) lack of or abnormal social play, (5) impairment in ability to make
friends. Criteria B lists symptoms of impaired verbal and non-verbal communication and imaginative activity. These symptoms include; (1) lack of communication, (2) abnormal non-verbal communication (e.g., abnormal eye gaze, gestures, lack of smile), (3) absence of imaginative activity (e.g., playing house) and lack of interest in made up stories, (4) abnormalities in speech production (e.g., volume, pace) (5) abnormalities in content and form of speech, such as repetition and stereotyped speech, (6) inability to initiate and sustain conversation. Criteria C included symptoms of restricted interests and activities manifested through at least one of the following; (1) stereotyped body movements, (2) preoccupation with specific parts of an object, (3) distress over trivial changes in the environment, (4) insistence on following routines, beyond what is reasonable, (5) restricted ranges of interest and preoccupation with one specific interest. Onset of these symptoms must begin during childhood or infancy.

The DSM-IV (1994) retained much of the same diagnostic criteria for autistic disorder that the DSM-III used for infantile autism and the DSM-III-R used for autistic disorder. In order to be diagnosed with autistic disorder, an individual must have met at least six, of the 15 listed symptoms from criteria (1), (2), and (3), with one symptom from each criterion and at least two from criteria (1). Criteria (1) consists of impairment of social interaction, with symptoms of (a) impairment in multiple non-verbal behaviors, (b) inability to develop peer relationships, (c) lack of seeking spontaneous shared enjoyment achievements, or interests with other, (d) lack of emotional or social reciprocity. Criteria (2) consists of impairments in communication with the symptoms: (a) delayed of no verbal language, (b) for those who can speak, difficulty initiating and maintaining conversation, (c) repetitive and stereotyped behavior, (d) lack of varied and spontaneous
make-believe or social play. Criteria (3) includes symptoms consistent with restricted repetitive patterns of behavior, activities, or interests, including: (a) preoccupation with at least one stereotypes or restricted interest pattern, with abnormalities in focus or intensity, (b) inflexibility in adherence to routines or rituals, (c) repetitive and stereotyped motor movements (e.g., finger flapping), (d) preoccupation with parts of an object. Further, there must be abnormal functioning before the age of three years in language, social interaction, or imaginative play. Additionally, the disturbance cannot be better explained by Asperger’s syndrome, Rett’s disorder, or Childhood Disintegrative Disorder.

Though *DSM-IV* (1994) maintained the diagnosis autistic disorder it added Rett syndrome, Childhood Disintegrative Disorder, and Asperger syndrome in an attempt to clarify and capture the unique differences and nuances found in the entire autistic spectrum (Blacher & Christensen, 2011). One of the rationales behind the multiple disorders in the *DSM-IV* was that researchers accepted the premise of a biological cause for autism, and they were seeking the gene or genes responsible. However, after the completion of the Human Genome Project in 2003, no specific gene was found to be responsible for autism (Zeldovich, 2018). In part because no genetic cause had been found, psychiatrists and psychologists moved to classify autism as an inclusive spectrum; thus in *DSM-5*, the three similar disorders were deleted, and the diagnosis changed yet again to autism spectrum disorder (ASD).

In *DSM-5* (2013), autism spectrum disorder is defined as persistent deficits in social communication and interactions, and restricted or repetitive patterns of interests, activities, and behaviors. In addition, symptoms must begin presenting themselves in early childhood, impair functioning, and cannot be better explained by a developmental
disability. *DSM-5* presented two categories of major symptoms: Criteria (A) Deficits in social interaction and communication across contexts including: (1) lacking social-emotional reciprocity, (2) deficits in nonverbal behaviors of communication inherent in social interaction, (3) deficits in developing, understanding and maintaining relationships with others, and Criteria (B) Restrictive and repetitive patterns of behaviors, consistent with two of the following symptoms; (1) repetitive of stereotyped motor movements, speech, or object use, (2) insistence of sameness, inflexibility when it comes to routines, or the ritualization of nonverbal or verbal behavior, (3) restricted, interests with abnormal focus of intensity, (4) hyper or hypo-reactivity to sensory stimuli, or unusual interest in sensory aspects of the environment. Additional criteria for ASD include C) symptoms presentation in early childhood, D) significant impairment in functioning due to symptoms, E) symptoms are not better explained by an intellectual disability. It is interesting to note that the *DSM-5* Criteria (B) specifies two of the four symptoms for a diagnosis of ASD, while there is no specification for the number of symptoms in Criteria (A). Whether this lack of specification for Criteria (A) reflects a diagnostic oversight in the *DSM-5* ASD Task Force or something less sinister cannot be ascertained.

Some additional symptoms of ASD include social reciprocity deficits, and difficulty with socialization, often due to speech and linguistic impairments, as well as difficulty understanding social pragmatics (eye contact, turn taking, empathy, appropriate volume, etc.) (White et al., 2007). Further, those with autism have a tendency to become laser focused on certain topics, which is indicative of restricted interests, and are often unable to understand others’ disinterest in the topic or fail to find interest in others’ interest. This illustrates the restricted and repetitive behavior, which is characteristic of
autism (DSM-5; American Psychiatric Association [APA], 2013). Those with autism often also have difficulty understanding other’s emotions, non-literal language, understanding the perspective of others, relating to others, and have difficulty expressing emotions and distress.

Autism spectrum disorder varies in severity, determined by how much support the individual requires and the level of global dysfunction inflicted by social communication deficits and restrictive, repetitive behaviors. Level one is classified as those individuals needing support, level two is classified by individuals needing substantial support, and level three is classified by individuals needing very substantial support.

The Demographics of ASD

Gender: Autism spectrum disorder is diagnosed 4 times more often in boys than girls. However, as autism severity increases, the gender gap in diagnoses appears to close, suggesting that the milder symptoms may be more noticeable in boys than girls (Howley, 2019).

Prevalence: Interestingly, in DSM-III (1980) it was estimated that 4-5 in every 10,000 children were given a diagnosis of infantile autism. It is currently estimated that approximately 169 in every 10,000 children have an ASD diagnosis (Baio & Christensen, 2014), which indicates that there has been nearly a 38 times increase in ASD in less than four decades. This increase in the diagnosis ASD will be discussed shortly. Additionally, it has been noted that about 60% of those diagnosed with ASD are non-Hispanic white (Zablotsky et al., 2015), although this ethnic-specific diagnostic factor may be the result of better health access for non-minority children (Hoberman, 1992).
**Risk Factors:** Though the cause of autism has not yet been identified, environmental risk factors for the disorder include older parental age, environmental toxicities, history of maternal abuse, and low birth weight (Sifferlin, 2013). Genetically, heritability estimates range from 37-90%. Additionally, a specific genetic mutation has been found in about 15% of children with ASD.

**Neurological Etiologic Factors:** One of the strongest lines of evidence for the cerebellum’s role in cognitive processing comes from the link between cerebellar disturbances and autism (Coolidge, 2020). ASD is currently defined as a multisystem disorder, which affects the brain, immune system, gastrointestinal tract, and social and emotional functioning. As noted previously, ASD has two major clusters of behavioral symptoms: (1) social and emotional dysfunction, and (2) repetitive/stereotyped behavior. Cerebellar dysfunction has been consistently linked to ASD more than any other brain region. This evidence includes neuroimaging studies and a host of genetic studies. Interestingly, imaging studies have shown that the neocerebellum (lateral and posterior portions), which receive input from the prefrontal cortex (PFC) is most often implicated in ASD (Coolidge, 2020). One of the major social difficulties is a defect in Theory of Mind (ToM; the ability to understand correctly the thoughts and attitudes of other people). From the internal modeling perspective, it might be assumed that people with ASD are unable to form internal models that accurately reflect the thoughts of others. This might occur because explicit models can be formed by the prefrontal cortices and temporoparietal cortices, but the cerebellum’s contribution of complimentary implicit models, which contain error-checking mechanisms, cannot be generated.
Support for this theory of mind deficits in people with ASD cerebellar model deficiency hypothesis comes from a study by Van Overwalle, Baetens, Mariën, and Vandekerckhove (2014), who performed a meta-analysis of 350 neuroimaging studies of the cerebellum and social cognitive tasks. They found only marginal evidence for cerebellar involvement in most social cognitive domains, with profound exceptions. There was universally high cerebellar activation, (1) in tasks where mentalizing was highly abstract, for example, in determining when groups of others’ behavior involves particular traits or characteristics (i.e., stereotyping groups); (2) when imagining past personal events or imagining or simulating future events; and (3) in tasks requiring imagining hypothetical events (i.e., counterfactualizing). Again, this finding supports the advantages of the implicit modeling and error correcting functions of the cerebellum in the cerebro-cerebellar network, and the psychopathological repercussions when this system is dysfunctional (Coolidge, 2020).

It is also important to reemphasize that ASD is not only a multisystem disorder, but it also exhibits a high degree of phenotypic and genotypic variability. Thus, Yuen et al.’s (2017) recent claim that the genetic predisposition for ASD “… may be different for almost every individual…” (p. 603) helps to establish that ASD may have various distinct subtypes, each with distinct genotypic contributions. Therefore, linking some types of ASD to cerebellar dysfunction may have a sound basis, but linking all forms of ASD to cerebellar dysfunction may not be warranted (Coolidge, 2020).

**The Increase in ASD: False Positives or False Negatives?**

In 5 years, from 2011 to 2016, the diagnosis of ASD has almost doubled, from 1 in 80 children to nearly 1 in 36 children (Sears, 2017). In addition, the dual diagnosis of
autism with an additional developmental disability dropped from 67% to 23% (Zablotsky, at al., 2015). According to Pacton (2015), a study by the CDC found that more than 9% of children are misdiagnosed with ASD and 4% of children ‘lose’ their ASD diagnosis through therapy and maturation. This increase in prevalence of ASD raises the issue of whether ASD had been simply undercounted (false negatives) or whether the increase reflects an overcounting (i.e., overdiagnosis or false positive). It appears that both factors may be operating. For example, it is thought that the higher rates of ASD in non-Hispanic whites, as noted previously, may simply reflect poorer access to health care for minority children. The same may be true of U.S. states that have better health care. For example, New Jersey (better health care) has higher rates of ASD than Arkansas (poorer healthcare)(Wenger, 2015). In addition, Hansen, Schendel, and Parner (2015) report that the recent increase in ASD diagnoses is partially due to change in diagnostic criteria.

However, it has long been a majority that ASD is being overdiagnosed. For example, this overdiagnosis has occurred even in fictional literature. Bottomer (2007) diagnosed multiple characters from the book Pride and Prejudice by Jane Austen as having autism. In support of a diagnosis of autism, Bottomer listed as symptoms in the hero of the novel, Fitzwilliam Darcy, “frequent silences, social awkwardness, and selfish, unthinking behavior”, which Coolidge (2016) noted are simply traits of introversion. Dent (2007) argued that the overdiagnosis of autism, including that of fictional characters, is risky. Dent expanded on the idea, stating that an autism diagnosis is often seen in those who may be a scapegoat and at odds with society. At this point, it is important to note that true ASD is a life-long disorder, with a poor prognosis, as some claim that ASD children remain the same or get worse in the majority of the cases
(Mandal, 2019). Thus, to romanticize a disorder, which is life-long and can be highly pathological not only to the patient but their family, may be an injustice.

Further evidence for false positives in the diagnosis of ASD comes from Densmore (2015) who suggested that many children with an ASD diagnosis are given an alternative diagnosis after more careful scrutiny of their symptoms and behavioral problems. Densmore provided case studies to illustrate the misdiagnosis of autism, including that of a child whose aggressive behavior and inability to sleep was due to pain induced by gastrointestinal issues, rather than the autism diagnosis he was given; a child who would rarely look up and speak, but actually had a language delay; and another child who had developmental verbal dyspraxia (apraxia) rather than autism. Densmore admitted that these disorders may present themselves in ways which appear similar to autism, however other disorders must be taken into consideration before giving an ASD diagnosis. It is important to note, however, that even in the case study of the child with gastrointestinal issues, that as a multisystem disorder, ASD can present itself in that fashion. Additionally, Densmore provided no information about following up on these cases, in order to ensure that their misdiagnosis was actually appropriate. Hopefully, children presenting such symptoms are followed up over time to insure a proper diagnosis.

**A Brief History of Schizoid Personality Disorder**

Like autism, the term ‘schizoid” was first coined by Eugen Bleuler in 1908. Bleuler first used this term to describe people who were suspicious, shut-in, yet still displayed sensitivity (Akhtar, 1987). This original description of the disorder can be seen in the first version of the *DSM* (APA, 1952). Bleuler believed that these traits were pre-
psychopathological and could be indicative of a future diagnosis of schizophrenia (Defaud & Rzesnitzek, 2016). Beginning in 1925, research on schizoid personality traits began to diverge along two separate paths: the descriptive psychiatry tradition, and the dynamic psychiatry tradition (Kretchmer, 1931). The descriptive tradition was developed by Ernst Kretschmer in 1925, when he began describing the observable behaviors of those deemed “schizoid”. Kretschmer (1931) split these behaviors into three characteristics: unsociability, timidity, and pliability. These three groups of behaviors were then each interpreted as a separate disorder in the DSM-III; that of schizotypal, avoidant, and schizoid personality disorders (Kretschmer, 1931). At this time, Bleuler was developing a dynamic psychiatry tradition, in which the schizoid person and schizoid pathology were seen as one in the same. The dynamic tradition believed there were unconscious motives behind the observable schizoid behaviors. Fairbairn (1941) described the psychopathology of schizoid personality individuals, and he also separated schizoid people from psychopathic personalities, from those experiencing schizoid transient episodes, and from those with schizophrenia. Fairbairn also noted three important characteristics of the schizoid personality disorder. These characteristics included: (1) an omnipotence attitude, (2) an isolated and detached manner, and (3) preoccupation with an inner reality. Interestingly, Fairbairn noted that according to his definition we are all a little “schizoid”, stating that even the experience of déjà vu could count as a schizoid moment.

Schizoid personality disorder originally appeared in the first DSM. It listed three traits: (1) avoidance of close relationships, (2) inability to express hostility or aggression directly, and (3) autistic thinking. These traits follow Bleuler’s description, such as “shut-
in-ness” and sensitivity. At this time, there were no specifically listed diagnostic criteria, so it appears this description of schizoid personality disorder formed the foundation for future diagnostic criteria. DSM-II varied slightly in the criteria, listing: (1) a patterned behavior of shyness, (2) avoidance of close relationships, (3) inability to express anger, and (4) detachment. However, the DSM-II added “autistic thinking without loss of capacity to recognize reality” into the description of schizoid personality disorder (APA, 1968). Again, there was not an official listing of diagnostic criteria.

The DSM-III-R (1987) removed the symptom “autistic thinking” but finally added specific individual criteria and a criterion for a diagnosis. A diagnosis of schizoid personality disorder had to include at least four of the following seven criteria: (1) neither enjoys or desires close relationships, including being the part of a family, (2) chooses solitary activities almost always, (3) rarely or never appears or claims to experience strong emotions, (4) has little to no desire to engage in sexual activity with another individual, (5) has indifference to the criticism or praise of other people, (6) has no close friends besides first-degree family members, (7) has constricted affect. It also noted that the criteria appeared in the order of their known prevalence rates, thus, the first criterion, “neither enjoys nor desires close relationships,” should theoretically be the most prevalent of all 7 criteria.

DSM-IV (1994) added that the symptoms may begin appearing in childhood with “poor peer relationships, underachievement in school, and solitariness.” The criteria essentially remained the same, with a few rewordings. It also noted that the symptoms do not occur as part of a diagnosis of schizophrenia.
Schizoid personality disorder is currently described in the *DSM-5* (2013) as a pattern of social and interpersonal deficits marked by discomfort with, and an inability to form, close relationships. It also stated those with the disorder had cognitive or perceptual distortions, and eccentric behavior beginning in early adulthood and constant over a variety of contexts. A person must have at least four of the following to be diagnosed; (1) little desire or enjoyment of close relationships, (2) chooses to engage in solitary activities, (3) little to no interest in sexual relations with another person, (4) only finds a few activities pleasurable, (5) has no close friends, (6) indifference to criticism or praise, and (7) expressed emotional detachment or coldness. Again, these symptoms were essentially similar to the criteria in *DSM-III*.

**Demographics of Schizoid Personality Disorder**

*Gender*: Schizoid personality disorder is found slightly more often in men than women. Additionally, men may be more impaired by the symptoms of schizoid personality disorder than women (APA, 2013).

*Prevalence*: The *DSM-III* stated that schizoid personality disorder was extremely rare, with only 3% of the population being diagnosed with the disorder. Currently, approximately 14.79% of American adults have at least one personality disorder, with 3.13% of these Americans having schizoid personality disorder (Grant et al., 2004). Thus, rates of schizoid personality disorder have remained relatively stable across time.

*Risk Factors*: Environmentally, high risk-associated stress during childhood is associated with the development of schizoid personality disorder, as are emotionally cold or detached parents (Martel, 2017). There is also support for a genetic component of
schizoid personality disorder, as it is found more often in those who have relatives which have been diagnosed with schizotypal personality disorder or schizophrenia (APA, 2013).

Neurological factors: There appears to be no literature on the biological foundations of the schizoid personality disorder.

A Brief History of Introversion

Carl Jung (1921) described extroverts as those who directed their energy outwards whereas introverts directed their energy inwards, causing them to engage in more thoughtful, and solitary activities. Jung also described introverted individuals as thinking subjectively, where their ideas are developed and then pursued inwardly. He noted introverts often had difficulty relating to others, such that they felt they were unwanted or unimportant. Jung stated: “His (sic) judgment appears cold, obstinate, arbitrary, and inconsiderate, simply because he is related less to the object than the subject” (p. 486). Jung also noted that other individuals often felt neglected by introverts, and they may end up avoiding them. For this reason, Jung thought introverts were often misunderstood and that they may build a wall masking their real personalities. For these reasons, Jung’s description of introverts appears to be one of subjectivity and internalization.

Additionally, Jung thought introverts could feel a sense of anger when their subjective viewpoints were not appreciated by others. As for the introverted feeling type, Jung stated introverts may also appear as cold, and others may sense indifference in them for the welfare and comfort of others. Jung’s overall appraisal of the introvert is one which is self-focused and unable to connect and understand the importance of others. These characteristics, when exaggerated to a point of dysfunction, resemble those
symptoms of schizoid personality disorder and autism. Importantly, Jung was not
pathologizing introverts, but rather he was trying to explain their patterns of behavior.

**Differences in Disorder Symptomology**

Clearly, differentiating among introversion, autism, and schizoid personality
disorder symptoms can be difficult, as many of the symptoms may vary only by severity,
regularity, or chronicity. According to Wolff and Barlow (1978), three key features
differentiate ASD from schizoid personality disorder: (1) absent or seriously impaired
language development with echolalia, (2) lack of emotional responsiveness with gaze
avoidance, and (3) ritualistic, compulsive behavior. Their empirical study consisted of
developing typically school-aged children, children with ASD, and children with a
schizoid diagnosis. They found that children with schizoid personality disorder were
more similar to developing typically peers verbally, and ASD children perseverated more
on tasks than both schizoid and typical children. Schizoid children typically had
intermediate scores between developing typically and ASD children. Schizoid children
were also less able to describe the emotions of others, interestingly, even more so than
those with autism. However, it must be noted the groups in this study were not
representative of the general population due to the matching procedure of participants,
such that the autistic group had above average intelligence for the general population, and
the schizoid group had below average intelligence. Though there are key differences
between the two disorders, with language development, emotional responsiveness, and
compulsive behavior being the three most salient differences between the two disorders,
there are many overlapping characteristics as well.
Similarities in Disorder Symptomology

Schizoid and ASD are both more common in males, with a ratio of 9:1 (Wolff, & Barlow, 1987) and 4:1 (DSM-5), respectively. They share features of a preference for engaging in solitary activities, having educational difficulties, aggressive outbursts in response to pressure, preoccupation with their own ideas and interests, and rigidity. This preoccupation with subjective interests is also found in Jung’s (1921) description of introversion, where he stated that introverts concern themselves with subjective factors and thinking, creating a detachment and alienation from the object [others]. He supported this claim by stating the introverted thinking “begins with the subject and ends with the subject” (p. 481). He also noted that if only the introvert could be left alone to pursue his (sic) own subjective ideas, he would be happiest. Further, he noted introverts often had difficulty connecting the outer world to their inner world, making it difficult for others to understand what they are trying to express. This difficulty in expression of one’s thoughts is common in autism as well and is indicative of the “inner autistic world” first described by Bleuler. Further, mothers in the Wolff and Barlow (1978) study described their children, both those with schizoid personality disorder and those with autism as first displaying difficulties in preschool. These difficulties included adapting to new situations, lacking emotionality, empathy, and connection, being withdrawn and quiet, and many described odd ideation, sometimes expressing paranoia. The pattern of these traits beginning in early childhood may be indicative of life-long struggles that ASD and schizoid children will experience throughout their lives.


**Justification for the Present Research**

Leo Kanner (1946) first used the term ‘infantile autism’ to describe children who seemed socially isolated and withdrawn. He went on to describe other traits similar to what we see in ASD today, however the social isolation first described by Kanner has made it difficult to differentiate pathological disorders from non-pathological introversion. The difficulty with properly differentiating a diagnosis of ASD from introversion and schizoid personality disorder makes the development of a psychometric with differentiating properties pivotal. A reliable psychometric would allow clinicians to properly utilize early intervention techniques, which could be the difference between a child’s future independence or perpetual dependency. Wolff (1995) compared and contrasted the therapies utilized in treating schizoid personality disorder versus ASD, revealing the inefficiencies of each’s therapies on the opposing disorder. Applied behavioral analysis (ABA), a popular early intervention technique for ASD would do little to aid a child with schizoid personality disorder, as often times the difficult traits in those with schizoid personality disorder stem from a lack of desire to preform, rather than an inability to. Having a child with schizoid personality disorder go through years of ABA therapy would result in countless missed opportunities to provide a child with effective therapy. For those with schizoid personality disorder, Wolff suggested small class sizes with one on one attention to assist schizoid children who are unable to cope with the pressures of school. Wolff also suggested validating the child’s emotions and feelings, offering family support, and the use of medication to treat symptoms such as anxiety and attentional deficits for those with schizoid personality disorder. In addition, those with schizoid personality disorder usually do not require extensive continued
treatment throughout their lives, whereas those with ASD may. Often times an ASD diagnosis requires life-long therapy, including behavioral management therapy, early intervention and educational therapies, speech-language therapy, and nutritional, occupational, and physical therapy (Autism Treatment, Prognosis, n.d.). The prognosis for those with ASD varies widely depending where on the spectrum the individual falls. For those severely affected, residential treatment may be necessary; whereas those with a milder form of the disorder may go on to live relatively normal lives with the help of early intervention and continued psychotherapy. The specific differential treatments and prognoses between ASD and schizoid personality disorder, as well as the similarity in symptomology between the disorders and non-pathological introversion, support the need for a reliable psychometric tool.

It is also important to note that a broad autistic phenotype has been observed even in non-clinical samples. Hurley et al. (2007) created a measure to assess this phenotype, the broad autism phenotype (BAP), which they defined as a set of personality traits and language usages that reflected a general phenotypic expression of some genetic susceptibility to autism. Subsequent studies affirmed the BAP in non-clinical samples (Ingersoll et al., 2011). It has also been established that the introversion personality dimension is typically more associated with various types of psychopathology than the extroverted dimension (e.g., Coolidge et al., 2001). Thus, it is important in the present study to determine whether autistic symptoms might not only be present in children who were developing typically (DT) but whether introverted children might score higher on a DSM-5 measure of autistic symptoms than extroverted children. This study will use the DSM-5 ASD criteria-aligned 84-item Coolidge Autism Symptom Survey (CASS;
Coolidge, 2019; Marle, et al., 2015), which provides an total sum score and sum scores for the three A ASD criteria subscales and the four B ASD criteria subscales.

**Hypotheses**

The first hypothesis for the present study (H\textsubscript{1A}) is that extroverted DT children will score significantly lower than introverted DT children on the total CASS sum and on all seven ASD CASS subscales (H\textsubscript{1B}). The second hypothesis (H\textsubscript{2A}) is that extroverted DT children will score lower on the total CASS sum than introverted DT children, introverted DT children will score lower than schizoid children, schizoid children will score lower than mild ASD children, mild ASD children will score lower than moderate ASD children, and moderate ASD children will score lower than severe ASD children. It is also hypothesized that this pattern will be the same across the seven CASS subscales (H\textsubscript{2B}). Finally, some exploratory principal components analyses will be performed on the CASS items and its subscales.
CHAPTER II
METHODS

Participants

A total of 171 CASS surveys were collected over two semesters. Twenty-nine surveys were excluded from analyses due to a parent (1) not checking a diagnosis, (2) not checking which level of autism the child had, (3) checking both introverted and extroverted on the survey, (4) checking comorbid diagnoses, or (5) checking ADHD or “other”. These exclusions resulted in a final total of 149 valid protocols (see Table 1).

Participants were recruited via undergraduate psychology classes and received two SONA or extra credit points for their participation. Unfortunately, none of the 149 final protocols met criteria, or more than two criterions for schizoid personality disorder. Therefore, the participants in the present study consisted of DT children (n = 75), which were further categorized on the basis of the demographic information (Appendix A) into the two groups of DT introverted (INT; n = 29), extroverted (EXT; n = 46), and ASD children (n = 74). The latter were further categorized into mild ASD (n = 31), moderate ASD (n = 29), and severe ASD (n = 14). The sample consisted of 62 females and 87 males. The ages of the children used for the surveys ranged between 5 and 17 years old (M = 11.07, SD = 4.08).

Materials

*The Coolidge Autism Symptom Survey (CASS)*: The 84-item, informant-as-respondent CASS provides coverage of all *DSM-5* ASD criteria and was designed to
Table 1

Data Breakdown

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>n</th>
<th>Age</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT</td>
<td>75</td>
<td>$M = 11.21$ \ $SD = 4.15$</td>
<td>$M = 37$ \ $F = 38$</td>
</tr>
<tr>
<td>DT INT</td>
<td>29</td>
<td>$M = 13.62$ \ $SD = 3.09$</td>
<td>$M = 12$ \ $F = 17$</td>
</tr>
<tr>
<td>DT EXT</td>
<td>46</td>
<td>$M = 9.70$ \ $SD = 4.03$</td>
<td>$M = 25$ \ $F = 21$</td>
</tr>
<tr>
<td>ASD</td>
<td>74</td>
<td>$M = 10.93$ \ $SD = 4.03$</td>
<td>$M = 50$ \ $F = 24$</td>
</tr>
<tr>
<td>Mild ASD</td>
<td>31</td>
<td>$M = 10.48$ \ $SD = 3.99$</td>
<td>$M = 24$ \ $F = 7$</td>
</tr>
<tr>
<td>Moderate ASD</td>
<td>29</td>
<td>$M = 11.21$ \ $SD = 3.89$</td>
<td>$M = 18$ \ $F = 11$</td>
</tr>
<tr>
<td>Severe ASD</td>
<td>14</td>
<td>$M = 11.36$ \ $SD = 5.57$</td>
<td>$M = 8$ \ $F = 6$</td>
</tr>
<tr>
<td>Total</td>
<td>149</td>
<td>$M = 11.07$ \ $SD = 4.08$</td>
<td>$M = 87$ \ $F = 62$</td>
</tr>
</tbody>
</table>

assess ASD symptoms in children 5 to 17 years old. Each of the items is answered on a 4-point Likert-type scale, ranging from 1 = *Strongly False*, 2 = *More False than True*, 3 = *More True than False*, to 4 = *Strongly True*. The CASS includes the *DSM-5* ASD criteria for Section A: Social Communication/Interactions Deficits, and its three components (Deficits in social-emotional reciprocity; Deficits in nonverbal communicative behaviors used for social interaction; Deficits in developing, maintaining, and understanding relationships) and Section B: Repetitive/Restricted Behaviors and its four components
(Stereotyped or repetitive motor movements, use of objects, or speech; Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior; Highly restricted, fixated interests that are abnormal in intensity or focus; Hyper-reactivity or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment). Preliminarily, it appears that the CASS has excellent internal reliability (Cronbach’s $\alpha = .99$), and it can distinguish among children developing typically from mild ASD and moderate to severe levels of ASD (Marle et al., 2015).

Participants also received a child questionnaire, which specified that the survey must be filled out about a child between the ages of five and seventeen years of age. The questionnaire contained questions regarding the child’s age, and biological gender. The questionnaire also gave a description of introversion and extroversion, and asked informants to pick which description best matched the personality of the child. It also contained descriptions of developing typically children, Attention-deficit hyperactivity disorder, autism spectrum disorder, schizoid personality disorder traits, and an “other” category, which listed several disorders, and asked the participant to circle which disorder(s) the child is diagnosed with. Participants were asked to indicate which of these disorders the child has been diagnosed with. If they indicated the child was diagnosed with ASD, they were then prompted to indicate level of severity: mild, moderate, or severe. If the chosen diagnosis was schizoid personality disorder, they were asked to circle which of the listed symptoms the child displayed.

**Procedure**

Each student was given a copy of the Coolidge Autism Spectrum Survey (CASS) and the demographic questionnaire (see Appendix A & B) and asked to fill it out about a
child they know between the ages of five and seventeen. The survey and questionnaire were handed out at the beginning of the undergraduate class lecture. Informants were given between two and seven days to turn in their surveys. Informants were given instructions to read the directions carefully and to fill out the surveys completely. No personal information or identifiable information was asked about the child, but a name was required by the students so that they could receive two points extra credit or SONA credit for their participation. By turning in the survey informants consented to partake in the research. The surveys were then collected and run for analysis. No individual information was given back to the participants, but participants were told they could receive group information a year later by contacting the researcher. Researcher contact information was provided on the CASS.
CHAPTER III
RESULTS

Internal Reliability of the CASS

The overall internal reliability (Cronbach’s alpha) for the 84-item CASS for all 149 participants was excellent with $\alpha = .98$. The internal reliability of criteria A ($\alpha = .98$) and criteria B ($\alpha = .95$) was also excellent. The seven subscales; A1 ($\alpha = .92$), A2 ($\alpha = .95$), A3 ($\alpha = .92$), B1 ($\alpha = .85$), B2 ($\alpha = .82$), B3 ($\alpha = .86$), B4 ($\alpha = .90$) also all had good to excellent internal reliability.

Demographic Checks

Unfortunately, as noted earlier, an analysis of the demographic information (Appendix A) revealed that no parent included more than two schizoid criteria, and a majority circled only one or none. Therefore, a sample of children with schizoid personality disorder could not be included in the statistical analyses.

Statistical Analyses on Gender

Independent sample $t$-tests were then run for each group of children (DT, INT DT, EXT DT, ASD, mild ASD, moderate ASD, severe ASD). These tests revealed that DT males scored significantly higher ($M = 129.97$) than DT females ($M = 110.95$) on total CASS sum score, $t(73) = 3.09, p < .01$. Additionally, introverted males ($M = 140.75$) scored significantly higher than introverted females ($M = 111.29$), $t(27) = 3.66, p < .01$, however, extroverted DT males ($M = 124.80$) did not score significantly differently that extroverted DT females ($M = 110.67$). Additionally, as there some concern about gender
differences, specifically in the children with ASD, independent sample $t$-tests revealed that males with ASD ($M = 204.76$) did not score significantly differently on the total CASS sum score than females with ASD ($M = 208.50$) across any of the ASD levels. Specifically, males with mild ASD ($M = 180.00$) did not score significantly differently than females with mild ASD ($M = 175.71$); males with moderate ASD ($M = 221.11$) did not score significantly differently than females with moderate ASD ($M = 215.45$); and males with severe ASD ($M = 242.25$) did not score significantly differently than females with severe ASD ($M = 234.00$).

**Main Statistical Analyses**

Hypothesis 1: It was hypothesized ($H_{1A}$) that extroverted DT children ($n = 46$) would score significantly lower than introverted DT children ($n = 29$) on the total CASS sum. An independent samples $t$-test revealed that the extroverted DT children (CASS $M = 118.35$, $SD = 29.75$) did not score significantly different than the introverted DT children (CASS $M = 123.48$, $SD = 25.61$), $t(73) = 0.767$, $p = .45$, with a small effect size (Cohen’s $d = .18$). Thus, hypothesis $H_{1A}$ was not supported. Table 2 presents a summary of the $t$-test results of the comparison of the two groups across the seven subscales ($H_{1B}$). A review of this table reveals that the extroverted and introverted DT children did not score significantly different on the A1- Deficits in Social and Emotional Reciprocity, A2- Deficits in Nonverbal Communication, B2- Insistence on Sameness, and B4- Hyper/Hypo Reactivity to the Environment subscales, but that extroverted DT children scored significantly lower on the A3- Deficits in Relationships subscale, and significantly higher on B1- Stereotyped/Repetitive Motor Movements, and B3- Restricted/Fixed Interests subscales. Thus, hypothesis $H_{1B}$ was also partially supported.
Table 2

t-test Results for the Seven ASD Criteria Subscales

<table>
<thead>
<tr>
<th>ASD subscales</th>
<th>t-test</th>
<th>Cohen’s d</th>
<th>INT DT Means (SD)</th>
<th>EXT DT Means (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>$t(73) = 0.89, \ p = .38$</td>
<td>0.22</td>
<td>$29.97^a (6.97)$</td>
<td>$28.32^a (8.23)$</td>
</tr>
<tr>
<td>A2</td>
<td>$t(73) = 0.84, \ p = .84$</td>
<td>0.05</td>
<td>$22.24^a (5.55)$</td>
<td>$21.96^a (5.95)$</td>
</tr>
<tr>
<td>A3</td>
<td>$t(73) = 3.03, \ p = .003$</td>
<td>0.72</td>
<td>$24.31^a (5.33)$</td>
<td>$20.48^b (5.34)$</td>
</tr>
<tr>
<td>B1</td>
<td>$t(73) = -2.09, \ p = .04$</td>
<td>0.53</td>
<td>$8.34^a (1.80)$</td>
<td>$9.72^b (3.24)$</td>
</tr>
<tr>
<td>B2</td>
<td>$t(73) = 1.40, \ p = .17$</td>
<td>0.33</td>
<td>$9.52^a (2.76)$</td>
<td>$8.65^a (2.51)$</td>
</tr>
<tr>
<td>B3</td>
<td>$t(73) = -2.07, \ p = .04$</td>
<td>0.50</td>
<td>$9.59^a (3.12)$</td>
<td>$11.35^b (3.86)$</td>
</tr>
<tr>
<td>B4</td>
<td>$t(73) = 1.53, \ p = .13$</td>
<td>0.36</td>
<td>$20.93^a (5.85)$</td>
<td>$19.00^a (4.94)$</td>
</tr>
</tbody>
</table>

Subscales Legend: A1 - Deficits in Social and Emotional Reciprocity; A2 - Deficits in Nonverbal Communication; A3 - Deficits in Relationships; B1 - Stereotyped/Repetitive Motor Movements; B2 - Insistence on Sameness, B3- Restricted/Fixed Interests; and B4- Hyper/Hypo Reactivity to the Environment.

Note: Cohen’s $d$ effect size criteria; small = .20, medium = .50, large = .80

Note: Means with similar superscripts are not significantly different.

Hypothesis 2: It was hypothesized that both groups of DT children will score lower on the CASS than schizoid children, and schizoid children will score lower on the CASS than ASD children. Because of the lack of schizoid children in the final sample, this hypothesis was modified, and it was hypothesized ($H_{2A}$) that extroverted DT children ($n = 46$) will score lower on the total CASS sum than introverted DT children ($n = 29$), introverted DT children will score lower than mild ASD children ($n = 31$), mild ASD children will score lower than moderate ASD children ($n = 29$), and moderate ASD children will score lower than severe ASD children. ($n = 14$). A one-factor ANOVA revealed that the total CASS sum score was able to successfully discriminate among groups, $F(4, 144) = 90.54, \ p < .001, \ \eta^2 = .73$, (large effect size). Tukey’s post-hoc revealed that extroverted DT children ($M = 118.35$) and introverted DT children ($M =
123.48) did not score significantly different from each another; both groups of DT children scored significantly lower than mild ASD children ($M = 179.03$), moderate ASD children ($M = 218.97$), and severe ASD children ($M = 238.71$); mild ASD children scored significantly lower than moderate ASD children and severe ASD children; and moderate ASD children and severe ASD children did not score significantly different from each other. Thus, hypothesis $H_{2A}$ was partially confirmed.

Table 3 presents a summary of the ANOVA results of the comparison of the five groups across the seven subscales ($H_{2B}$). A review of this table reveals a similar pattern in four of the seven subscales: A1 - Deficits in Social and Emotional Reciprocity, A2 - Deficits in Nonverbal Communication, A3 - Deficits in Relationships, B2- Insistence on Sameness, and B3- Restricted/Fixed Interests. Specifically, extroverted DT children and introverted DT children did not significantly differ in their scores across the seven subscales; both groups of DT children scored significantly lower than mild ASD children; mild ASD children scored significantly lower than moderate and severe ASD children; and moderate ASD children and severe ASD children did not significantly differ across subscales. The two exceptions of this pattern are subscales B1- Stereotyped/Repetitive Motor Movements, in which moderate ASD children scored significantly lower than severe ASD children; and B4- Hyper/Hypo Reactivity to the Environment, which did not differentiate between introverted DT children and mild ASD children. Thus, hypothesis $H_{2B}$ was also partially supported.

**CASS Component Structure**

A preliminary principal components analysis (SPSS Version 26) was performed upon the 84 CASS items with varimax rotation, although the number of cases did not
Table 3

Tukey’s Post Hoc Results for the Seven ASD Criteria Subscales

<table>
<thead>
<tr>
<th>ASD subscale</th>
<th>Tukey’s Results Means (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ANOVA INT DT</td>
</tr>
<tr>
<td>A1</td>
<td>F(4,144) = 61.38, p &lt; .001, η² = .68</td>
</tr>
<tr>
<td>A2</td>
<td>F(4,144) = 78.17, p &lt; .001, η² = .68</td>
</tr>
<tr>
<td>A3</td>
<td>F(4,144) = 74.66, p &lt; .001, η² = .67</td>
</tr>
<tr>
<td>B1</td>
<td>F(4,144) = 44.59, p &lt; .001, η² = .55</td>
</tr>
<tr>
<td>B2</td>
<td>F(4,144) = 38.39, p &lt; .001, η² = .51</td>
</tr>
<tr>
<td>B3</td>
<td>F(4,144) = 42.41, p &lt; .001, η² = .54</td>
</tr>
<tr>
<td>B4</td>
<td>F(4,144) = 34.62, p &lt; .001, η² = .49</td>
</tr>
</tbody>
</table>

Subscales Legend: A1 - Deficits in Social and Emotional Reciprocity; A2 - Deficits in Nonverbal Communication; A3 - Deficits in Relationships; B1- Stereotyped/Repetitive Motor Movements; B2- Insistence on Sameness; B3- Restricted/Fixed Interests; and B4-Hyper/Hypo Reactivity to the Environment.

Note: Cohen’s d effect size criteria; small = .20, medium = .50, large = .80
Note: Means with similar superscripts are not significantly different.

meet the recommended minimum for 84 items (about 420 cases would have been required). The scree plot suggested a one component solution. A two-component extraction was then performed with varimax rotation. The rotated component matrix revealed that 50 of the 84 CASS items loaded on Component 1. Of these 50 items, 37 were from ASD Criteria A. Thirty-four CASS items loaded on Component 2. Of those 34 items, 21 were from ASD Criteria B. Thus, it appears that Component 1 aligns more clearly with ASD Criteria A - Persistent Deficits in Social Communication/Interaction,
and Component 2 aligns with ASD Criteria B – Restricted, Repetitive Patterns of Behavior. These preliminary results appear to support the two major criteria categories in *DSM-5* for ASD.

A second principal components analysis (SPSS Version 26) was performed upon the 3 subscales of the ASD A Criteria and the four ASD B Criteria subscales (a ratio of about 21 cases to items). A one component solution was obtained with an eigenvalue of 5.63, and it accounted for 80.4% of the total variance. Thus, this analysis strongly suggests that all 7 subscales are measuring a single concept, i.e., autism. Table 4 presents the intercorrelation matrix of the 7 subscales. All of the intercorrelations were strong and significant at $p < .001$, which again supports the notion of a strong underlying high first factor concentration.

Table 4

Intercorrelation Matrix of the Seven Subscales of the DSM-5 ASD Criteria

<table>
<thead>
<tr>
<th></th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>-</td>
<td>.92</td>
<td>.90</td>
<td>.71</td>
<td>.80</td>
<td>.81</td>
<td>.79</td>
</tr>
<tr>
<td>A2</td>
<td>-</td>
<td>-</td>
<td>.89</td>
<td>.77</td>
<td>.75</td>
<td>.80</td>
<td>.75</td>
</tr>
<tr>
<td>A3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.68</td>
<td>.75</td>
<td>.78</td>
<td>.74</td>
</tr>
<tr>
<td>B1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.61</td>
<td>.73</td>
<td>.72</td>
</tr>
<tr>
<td>B2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.75</td>
<td>.75</td>
</tr>
<tr>
<td>B3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.76</td>
</tr>
<tr>
<td>B4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Subscales Legend: A1 - Deficits in Social and Emotional Reciprocity; A2 - Deficits in Nonverbal Communication; A3 - Deficits in Relationships; B1 - Stereotyped/Repetitive Motor Movements; B2 - Insistence on Sameness, B3 - Restricted/Fixed Interests; and B4 - Hyper/Hypo Reactivity to the Environment.

Note: All correlations are significant at $p < .001$, $n = 149$
CHAPTER IV
DISCUSSION

Gender Findings

The finding that gender was significantly correlated with the total CASS sum score, specifically that males scored significantly higher on the total CASS sum score than females, appears to have been due primarily to gender differences in the DT children rather than the children with ASD. There were no significant differences in CASS scores between the male and female children with ASD across all three severity levels. Thus, in terms of gender issues for the interpretation of the CASS, these findings support the hypothesis that gender specificity does not play a major role in the CASS scores. It does appear that the severity of the ASD symptoms is the major driving force for CASS score levels.

Main Findings

The hypothesis (H_{1A}) that extroverted DT children would score significantly lower than introverted DT children on the total CASS sum was not supported. It was also hypothesized (H_{1B}) that extroverted DT children would score significantly lower than introverted DT children across the seven subscales (three criteria A subscales and four criteria B subscales). This hypothesis was partially supported. Extroverted DT children did score significantly lower than introverted DT children on subscale A3- Deficits in Relationships. Since introversion is often marked by few close relationships and a preference for solidary activities, whereas extroversion is indicative of a preference for
social interaction, it would be expected that extroverted DT children would score lower than introverted DT children on this subscale. However, contradictory to what was originally hypothesized, extroverted DT children scored significantly higher on the B1-Stereotyped/Repetitive Motor Movements, and B3- Restricted/Fixed Interests subscales. This may be due to the observable and behavioral nature of these subscales. Introverted DT children who display such behaviors may go unnoticed as these children prefer solitary activities. These behaviors may be more noticeable in extroverted DT children, as these children are more likely to engage with others. Extroverted and introverted DT children did not score significantly differently on subscales A1- Deficits in Social and Emotional Reciprocity, A2- Deficits in Nonverbal Communication, B2- Insistence on Sameness, and B4- Hyper/Hypo Reactivity to the Environment. This could be due to the threshold needed to make these subscales memorable or noticeable to others.

The hypothesis (H$_{2A}$) that extroverted DT children will score lower on the total CASS sum than introverted DT children, introverted DT children will score lower than mild ASD children, mild ASD children will score lower than moderate ASD children, and moderate ASD children will score lower than severe ASD children was also partially supported. Extroverted DT children and introverted DT children did not score significantly differently from each another; both groups of DT children scored significantly lower than mild ASD children, moderate ASD children, and severe ASD children; mild ASD children scored significantly lower than moderate and severe ASD children; and moderate ASD children and severe ASD children did not score significantly different from each other. The inability for extroverted DT children and introverted DT children to differentiate was addressed in the first hypothesis. The inability of moderate
and severe ASD children to differentiate may be due to the relatively subjective
differentiation of mild ASD from severe ASD. The *DSM-5* defines moderate ASD as
“requiring substantial support” and severe ASD as “requiring very substantial support”.
The subjectivity in differentiating “substantial” from “very substantial” may cause
confusion for informants about whether the child is truly mildly or severely autistic. In
addition, the relatively small sample of severe ASD children (*N* = 14) could have also
impacted differentiation ability.

The hypothesis (H$_{2B}$) that a similar pattern would be seen across the seven
subscales was also partially supported. Five of the seven subscales: A1 - Deficits in
Social and Emotional Reciprocity, A2 - Deficits in Nonverbal Communication, A3 -
Deficits in Relationships, B2- Insistence on Sameness, and B3- Restricted/Fixed Interests
revealed the same pattern as hypothesis H$_{2A}$. Specifically, extroverted DT children and
introverted DT children did not significantly differ in their scores across the seven
subscales; both groups of DT children scored significantly lower than mild ASD children,
moderate ASD children, and severe ASD children; mild ASD children scored
significantly lower than moderate and severe ASD children; and moderate ASD children
and severe ASD children did not significantly differ across subscales. However, in
subscale B1- Stereotyped/Repetitive Motor Movements, moderate ASD children scored
significantly lower than severe ASD children. This could be due to the largely theatrical
nature of some of these movements in children with severe autism. This includes self-
injurious behaviors as well as behaviors that could last for minutes. Thus, this subscale
may lend itself to be divided more readily into mild, moderate, and severe categories.
In addition, subscale B4- Hyper/Hypo Reactivity to the Environment, did not differentiate between introverted DT children and mild ASD children. This highlights one of the main overlapping characteristics of introverted children and ASD children. Both introverted DT children and mild ASD children have a tendency to retreat into internal worlds. This retreat can translate as hypo-reactivity, as these children are not presently paying attention to their environment. This retreat can also cause hyper-reactivity, due to a startle response when taken out of their own world, or due to the drastic differences between their own world and reality. Jung described this characteristic in introverts as a difficulty in connecting inner and outer worlds. This description is much like Blueler’s description of an “inner autistic world” in those displaying characteristics of what would become autism. These two descriptions highlight the similar behaviors among introverted and autistic children.

The preliminary exploratory principal components analysis (PCA) was performed upon the 84 CASS items with varimax rotation. The scree plot suggested a one component solution. This one factor solution suggests that all 84 items are measuring a single concept. Since the 84 CASS items are based off the *DSM-5* criteria for ASD, this high first factor correlation could be indicative of the single concept: autism. A two-component extraction was then performed with varimax rotation. The rotated component matrix revealed that 50 of the 84 CASS items loaded on Component 1, and of these 50 items, 37 were from ASD Criteria A. Thirty-four CASS items loaded on Component 2, and of those 34 items, 21 were from ASD Criteria B. Thus, it appears that Component 1 aligns more clearly with ASD Criteria A - Persistent Deficits in Social Communication/Interaction, and Component 2 aligns with ASD Criteria B – Restricted,
Repetitive Patterns of Behavior. Components not loading under their corresponding criteria may be explained by the inadequate number of cases used in running the PCA on the 84 items. (A minimum of about 420 cases would have been required). However, these preliminary results appear to support the two major criteria categories in DSM-5 for ASD.

A second principal components analysis was performed upon the seven subscales. (The 3 subscales of the ASD A Criteria and the four ASD B Criteria subscales). A one component solution was obtained, and the analysis strongly suggests that all seven subscales are measuring a single concept, i.e., autism. The ability of the seven subscales to load under one component highlights their ability to measure ASD symptoms and differentiate developing typically children from ASD children, and mild ASD children from moderate and severe ASD children.

One of the limitations of this study was the lack of data collected on children who met DSM-5 criteria for schizoid personality disorder. As this was a major premise of this study, this lack of data was disappointing. In addition, the use of college students as informants for the CASS may have resulted in students making guesses about the child’s behavior across multiple contexts should they not live with or extensively spend time with that child. It would have been preferable to only include respondents who live with the child full-time, or who spend a majority of their time with the child across contexts, as to ensure respondents know the child’s behavior extensively. Ideal respondents would include parents, nannies, older sibling who still live with the child, or therapists who work extensively with one child throughout the week in a variety of settings. These individuals would be able to recall on past experiences with the child when completing the survey, rather than having to guess based off possibly limited interactions. Further, it
would be useful to have respondents provide proof of a clinical diagnosis of ASD, with an inclusion of severity level, should they choose to complete the CASS about a child with ASD. Proof of a professional diagnosis would confirm that a proper diagnosis and degree of severity was selected for the child in that survey. As discussed earlier, mild and severe cases of ASD can have overlapping symptomology. Having a professional diagnosis on record for each ASD child would help eliminate uncertainty about whether a correct diagnosis and severity level was being obtained from the respondent. It would be even more advantageous to have a clinician on site to evaluate each child using the Autism Diagnostic Observation Schedule (ADOS), which appears to be a popular standard of autism diagnosis and then to compare those results to that of the CASS, although this would be associated with time and monetary constraints. There are also additional ASD measures that could be employed, although few, if any, are completely DSM-5 ASD criteria aligned. Another concurrent measure that could have been used is the Parental Concern Questionnaire (Schroeder, Rojahn, An, Mayo-Ortega, Oyama-Ganiko, & LeBlanc, 2014). An additional limitation of the study was that there was an inadequate number of participants to properly run a principal component analysis on the 84 CASS items. Future studies should broaden their recruitment of informants to specifically include parents and a larger sample of children with severe ASD. Further, targeting groups which could provide information about children with schizoid personality disorder would also be beneficial.

The DSM-5 ASD criteria used in the CASS, (criteria A- Social Communication/Interactions Deficits, and its three components, and criteria B- Repetitive/Restricted Behaviors and its four components) allowed the CASS to
successfully discriminate between DT children and ASD children. The CASS’s ability to
differentiate between DT children and ASD children makes it a promising tool for
parents who are undecided about whether or not they should seek professional treatment
for their child. As stated earlier, early intervention techniques are essential for children
with ASD. However, early intervention does come at a cost, with families spending an
average of 60,000 dollars on a child with autism in just one year (Autism Facts and
Figures, autism.org). Though this cost may be well worth it for children who truly
struggles with ASD, it would be a costly and unnecessary price to pay for a child who is
simply introverted. By giving parents a tool that provides insight into whether or not their
child may simply be introverted, parents can then choose what steps to take next, such as
pursuing a professional diagnosis and or some form of early intervention.
REFERENCES


Schizoid Personality Disorder (ScPD) - Psychiatric Disorders. (n.d.).
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APPENDIX A

CHILD QUESTIONNAIRE

Please fill this questionnaire about any child that you know well between the ages of 5 and 17 years old. We do not need the child’s name.

1. Age of the child (in years): ______

2. Biological sex of the child: _________

3. Please read these descriptions of Introversion and Extroversion.

   Extroversion: talkative, sociable, outgoing, lively, optimistic, active, assertive, prefers to be with other people rather than being alone, likes group activities and social gatherings, likes to talk to other children or adults

   Introversion: quiet, reserved, shy, silent, passive, calm, prefers to be alone most of the time or to play with only one friend, prefers not to speak up in front of people

   Based on these personality descriptions, please place a check mark next to one of these two descriptions best fits the child:

   Introverted:_______  Extroverted:_______

4. Has this child been previously diagnosed with (please write in Yes or No; note that you may say Yes to more than one diagnosis):

   ________ Developing Typically: Behaviors: no major problems, seems able to cope OK with everyday stress and strain, keeps up with peers, makes friends fairly easily, relatively easy-going, occasional problems but overcomes them fairly quickly.

   ________ Attention-Deficit Hyperactivity Disorder (ADHD). Behaviors: acts like driven by a motor, problems sitting still, problems paying attention, etc.).
__________ Autism (Asperger’s Disorder, High-Functioning Autism, Autism Spectrum Disorder). Behaviors: social and emotional problems relating to other people, repetitive behaviors, extreme sensitivity to environmental stimuli (sounds, lights, touch, tastes, smells) or extreme insensitivity to environmental stimuli. If, Yes, please circle whether: mild moderate severe

__________ Schizoid Personality Disorder Traits:
Behaviors: No close friends other than family members, shows little emotion, does not enjoy close relationships, does not desire close relationships, no curiosity about sex, almost always chooses to do things by themselves, does not care about being praised, does not care about being criticized. Please circle which ones.

__________ Other Diagnoses: Gender Dysphoria (not happy with their biological sex), extremely anxious, multiple concussions, severe head injury, experienced a highly traumatic event, frequent temper tantrums, conduct disorder, truancy, stealing, illegal drug use, arrested by police. Please specify by circling any that are appropriate.
APPENDIX B

COOLIDGE AUTISTIC SYMPTOM SURVEY

By completing and turning in this survey you are giving your informed consent to allow researchers to use the data received for analysis. Any further questions can be directed to Dr. Coolidge at fcoolidg@uccs.edu.

For this portion, try to answer how your child or this child has behaved for most of his/her life or what appears to be characteristic of how your child or this child acts most of the time now.

Please rate each item on the following scale:

1 = Strongly False
2 = More False Than True
3 = More True Than False
4 = Strongly True

Please rate the following items for your child (or this child):

1. My child uses inappropriate body language or gestures (e.g., turns away when spoken to, etc.).
2. My child talks less than other children his/her age.
3. My child seems emotionally cold or detached.
4. My child is unable to give messages with his or her eyes (e.g., rolls her/his eyes in annoyance).
5. My child misuses pronouns like substituting “I” for “you,” “him” for “me,” or “her” for “me.”
6. My child repeats over and over exactly what is said to him or her.
7. My child doesn't seem to laugh at jokes others his/her age find funny.
8. My child has no close friends.
9. My child stops her/his train of thought if interrupted. _________

10. My child potty trained later than most children her/his age. _________

11. My child laughs for reasons I don’t understand. _________

12. My child has trouble playing like other children his or her age (for example, pretending or make-believe). _________

13. My child prefers things to be the way she/he originally found them. _________

14. My child has trouble reading other people’s facial expressions. _________

15. My child has an intense dislike of change. _________

16. My child repeats the same word or phrase a lot. _________

17. My child tries to engage with other children, but doesn’t seem to know how _________

18. My child has trouble using his or her hands to express himself or herself (e.g., doesn’t use hands when talking, doesn’t give high fives or does so inappropriately, doesn’t fist-bump or does so inappropriately). _________

19. My child is a loner. _________

20. My child has a strange or weird handshake (or doesn’t shake hands at all). _________

21. My child is unaware of what he/she is communicating to others with his/her body language. _________

22. I have to remind my child to look at me or other people when talking to them. _________

23. My child drags his/her toes often when walking. _________

24. My child seems to not notice other people, even if they are in the same room. _________

25. My child only points out things to me that he/she is interested in or obsessed with. _________

26. My child often flaps her/his arms (as if flying like a bird). _________

27. My child has trouble expressing himself/herself. _________
28. My child acts physically inappropriately with other children (e.g., too much hugging, never wants to hug, too aggressive, etc.).

29. My child has difficulty understanding common expressions or takes phrases too literally, such as “If looks could kill,” “I’m history,” or “Has the cat got your tongue?”

30. My child often moves his/her fingers quickly in front of his/her face.

31. My child doesn't interact well with other children his/her own age.

32. My child has difficulty making or maintaining eye contact.

33. My child misinterprets what other people say (e.g., doesn’t understand, interprets what people say narrowly or inappropriately).

34. My child has trouble understanding the feelings of others.

35. My child has a strange or unusual rhythm or inflection when he/she speaks.

36. My child doesn’t seem to be as interested in as many different things as other children.

37. My child has limited use of gestures compared to other children.

38. Even when my child tries to approach other children, he/she finds it difficult.

39. My child has trouble hugging or kissing people.

40. If I point at something excitedly, my child will often not look.

41. My child finds it difficult to start a friendship.

42. My child often does not respond to his/her name.

43. My child misunderstands certain body language or gestures.

44. My child is uncoordinated or clumsy (e.g., riding a bike or running).

45. My child gets intensely interested or preoccupied with a single subject and doesn’t seem to want to do anything else (e.g., trains, vacuum cleaners, fire trucks, planes, details of plane wrecks, details of major accidents or natural disasters, Anime [Japanese cartoons] or other cartoon figures, and the Titanic).
46. My child gets preoccupied or interested with parts of objects or just one aspect of a toy (for example, how it feels or a noise that it might make). _____

47. My child can only stand little physical contact with others (as in hugging). _____

48. My child is overly fascinated by fans or other spinning objects. _____

49. My child brings me things that he/she is interested in. _____

50. It is difficult to tell what my child is feeling. _____

51. My child has a limited number of facial expressions compared to other children. _____

52. My child’s speech development was delayed (e.g., not using single words by age 2 and unable to use simple phrases by age 3). _____

53. My child approaches others only when he/she needs something for himself/herself. _____

54. My child is socially clumsy or awkward. _____

55. My child tends to avoid activities involving other children. _____

56. My child has to stick to some routine or rule and gets angry or upset if it is changed. _____

57. My child dislikes transition or changes (e.g. beginning of the new school year). _____

58. My child has inappropriate or exaggerated facial expressions (e.g., blank stares, little emotion, grimaces). _____

59. My child has a strong preference to only play with certain toys. _____

60. My child has trouble starting or maintaining conversations with others. _____

61. My child has no trouble starting conversations, but only about things he or she wishes to talk about. _____

62. My child has a different sense of humor from other kids (e.g. only laughs at puns, only when people get hurt). _____

63. My child is overly sensitive to lights, sounds, tastes, touch, or smells. _____
64. My child has reduced sensitivities to lights, sounds, tastes, touch, or smells._____
65. My child sounds like a “walking dictionary” or encyclopedia._____  
66. My child rocks back and forth. _____  
67. When talking to others, my child comes up too close to other people. _____  
68. My child talks too much, but only on specific topics. _____  
69. My child has trouble following conversations. _____  
70. My child neither speaks, nor tries to communicate through other means (for examples, pointing). _____  
71. My child is extremely sensitive to bright light. _____  
72. My child does not seem to respond to flashing lights. _____  
73. My child is very sensitive to loud noises. _____  
74. My child does not seem to respond to loud noises as he/she should. _____  
75. My child seems to have a constant need to touch certain things. _____  
76. My child cannot be touched without being uncomfortable. _____  
77. My child seems indifferent to smells (good or bad). _____  
78. My child has an intense interest with smelling certain objects. _____  
79. My child will only eat certain foods because of the taste. _____  
80. My child seems unresponsive to tastes of food. _____  
81. My child seems excessively sensitive to extreme temperatures outside. _____  
82. My child is not sensitive to extreme hot or cold temperatures. _____  
83. My child wanders away from home or school without permission. _____  
84. My child seems overly fearful at times, but lacks fear in other situations. _____
APPENDIX C

IRB APPROVAL

University of Colorado
Colorado Springs

Institutional Review Board (IRB) for the Protection of Human Subjects

Date: 03/05/2020

IRB PROTOCOL NO.: 19-181
Protocol Title: A Psychometric Investigation of the Coolidge Child Behavior Inventory
Principal Investigator: Sydney Nolan
Faculty Advisor if Applicable: Fred Coolidge
Application: Request for Change
Type of Review: Expedited
Risk Level: Minimal
This Protocol involves a Vulnerable Population:
Expiry: N/A

*Note, if exempt: If there are no major changes in the research, protocol does not require review on a continuing basis by the IRB. In addition, the protocol may match more than one review category not listed.

Externally funded:
OSP #: Sponsor:

Thank you for submitting your Request for IRB Review to allow students to participate using SONA system. The protocol identified above has been reviewed according to the policies of this institution and the provisions of applicable federal regulations. The review category is noted above, along with the expiration date, if applicable.

Once human subject research has been approved, it is the Principal Investigator’s (PI) responsibility to report any changes in research activity related to the project:
- The PI must submit all protocol, recruitment, advertising, and consent form amendments/revisions to the IRB for approval.
- The PI must approve these changes prior to implementation.
- Changes in funding status must be reported to the IRB as quickly as possible to ensure funding requirements are met.
- If you are a student, please note that it is required to include the IRB approval letter in the library when you submit the dissertation/thesis.
- The PI must promptly inform the IRB of all unanticipated serious adverse events (within 24 hours). All unanticipated adverse events must be reported to the IRB within 1 week (see 45CFR46.102(b)(3)). Failure to comply with these federally mandated responsibilities may result in suspension or termination of the project.
- The PI must submit a Continuing Review/Renewal application to the IRB at least 10 business days prior to expiration to continue projects beyond the expiration date (if applicable).
- Notify the IRB when the study is complete.

If you have any questions, please contact Research Compliance Program Director in the Office of Sponsored Programs and Research Integrity at 719-255-3903 or rho@uccs.edu

Thank you for your concern about human subject protection issues, and good luck with your research.

Sincerely yours,

Samantha Christiansen, Ph.D.
IRB Reviewer