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Anxiety in Relation to Narrative Deficits in Children with Autism Spectrum Disorders

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STATEMENT OF ORIGINAL AUTHORSHIP

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Latifa Alajmi

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'He who does not thank people, does not thank God'
Prophet Mohammad (PBUH)

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ABSTRACT

Children with Autism are known to present with language delays that affect their ability to relate their thoughts, ideas, feelings and emotions to others. These difficulties in turn reduce their chances in having successful interactions with their peers and may result in elevated anxiety. The main aim of this thesis is to explore the relationship between narrative skills and anxiety in children with Autism. Three studies were conducted, the first sought to confirm the narrative differences between 19 children with ASD and 20 children who are TD on narrative generation production. Results indicate that children with ASD use fewer story grammar elements, have more difficulty with referential accuracy and deviate more form the main story line by adding irrelevant information. Using data from the same groups, the second study evaluated whether the above three narrative measures are correlated to parent-reported anxiety and whether they may be used to predict anxiety. Collectively, having poorer language skills, poorer SG and RA scores, and increased deviation all indicate a child is more likely to experience anxiety. Results also show that AQ, deviation and the interaction variable between AQ and deviation, are significant predictors of anxiety, explaining the variance seen in parent-reported anxiety. The final study involved 3 children with ASD participating in a narrative intervention to determine whether improving narrative abilities would result in an improvement of theory of mind skills and a reduction in anxiety symptoms. The intervention was successful in improving narrative generation performance which coincided with an improvement on social cognitive tasks and a reduction in parent-reported anxiety post intervention. These results support a link between narrative abilities and the presentation of anxiety symptoms in individuals with autism that may be explained by deficits in neurocognitive functioning. The findings also have clinical implications towards improving assessment and treatment protocols by way of language for people with ASD and comorbid anxiety disorders.

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1. INTRODUCTION

Autism, or autism spectrum disorder (ASD) refers to a broad range of life-long developmental disorders characterised by impairments in social skills, repetitive behaviors with restricted interests, and speech and nonverbal communication (DSM-5, 2013). The clinical requirements of children and their families who find themselves affected by the diagnosis of autism have increased over the past decade, as has the number of diagnoses being made (Rutter, 2005; Fombonne, 2009; CDC, 2014). This places a strain on multiple sectors such as education, social care, welfare, and employment, extending significantly to the health care system and its providers (Ganz, 2007). An excessive financial burden that spans a lifetime and is shared by family members further compounds the situation (Buescher, Cidav, Knapp, & Mandell, 2014; Leigh & Du, 2015). The need to simultaneously deliver evidence-based, holistic intervention programmes, targeting key areas of deficiency found within this population, and adequate support systems, is not to be underestimated.

Language delay is the main reason children with ASD are initially referred for evaluation, with delayed language milestones strongly correlated to long-term prognosis (De Giacomo & Fombonne, 1998; Stone & Yoder, 2001). Psychiatric disorders such as attention-deficit/hyperactivity disorder, intellectual disability, and anxiety disorders are also common comorbidities with ASD (Simonoff, et al., 2008; Matson, & Shoemaker, 2009; Mannion, & Leader, 2016). Though previously studied, the reports on the relationship between language deficits and anxiety in children with high-functioning autism are conflicted, often due to differing methodologies and a wide age range. Language is integral in how people understand and describe to themselves and others their experience of anxiety (Petersen et al., 2014). Children with language deficits often sense they are dissimilar and isolated from their peers (Atwood, 2000) resulting in a negative view of self, social avoidance, and awkward interactions with peers that may further affect their ability to socialize with confidence (Myles, Barnhill, Hagiwara, Griswold, & Simpson, 2001). This process indicates that from language deficits, social problems and anxiety may develop and be maintained. Previously, the creation of personal positive narratives has been used successfully to treat anxiety (Cashin, 2008), social phobia (Looyeh, Kamali, Ghasemi, & Tonawanik, 2014), and depression (Shaibani, Yoosefi, Looyeh, & Delvar, 2007). Therefore, providing language intervention with the intention of reducing anxiety is a logical course of action to be explored.

This thesis has multiple aims, the first of which is to explore how narratives of children with ASD differ from those of typically developing (TD) children to add to the small and conflicted pool of data that currently exists. The second aim is to determine whether there is a correlation between anxiety levels and narrative abilities in children with ASD who require low support, when age, nonverbal IQ and language are controlled for. The third and final aim is to provide an intense narrative intervention programme that explores whether improving personal narrative abilities will result in a decrease in anxiety levels in children with ASD.

To provide a clearer link between the various aspects of this research, Chapter one, the literature review, will be separated into three parts reviewing the key areas to be explored, autism, narrative language, and anxiety. As the researcher is a Kuwaiti national, the data collection will take place in Kuwait, on Kuwaiti participants. A brief discussion on research in the field of autism in Kuwait will also be covered in Chapter one. Chapter two evaluates the narrative language of Kuwaiti children with ASD comparing their performance with typically developing (TD) peers. Chapter three investigates the association between narrative language and anxiety. Chapter four provides the rationale and methodology of the narrative intervention. Chapter five presents the results and discussion of the narrative intervention. Chapter six offers a general discussion and conclusions on the findings as a whole.

1.1 KUWAIT – AN OVERVIEW

Kuwait is located in the northern edge of Eastern Arabia and shares its borders with the Kingdom of Saudi Arabia and Iraq. Arabic is the official language in Kuwait though English is widely used in both government and private sectors.

State-run schools are either mainstream or cater solely to children with special educational needs. Al-Khalifa School is the only state-run school for children with autism across the spectrum. There are private schools that adopt a dual policy where a division of the schools resources is dedicated to students who have language delays, learning difficulties, Downs Syndrome, or are on the autism spectrum (Ministry of Education, 2015; Burney, Johnes, Al-Enezi, Al-Musallam, 2013).

The Ministry of Health oversees the state-funded healthcare system in Kuwait. There are two main state centers that provide interdisciplinary treatment services for children and adults with speech, language and swallowing problems, Sheikh Salem Al Ali Audiology and Speech Center

(SAASC) and the Physical Medicine and Rehabilitation Hospital (PMR). These services include speech and language therapy, physical therapy, audiology, occupational therapy, and hydrotherapy alongside a medical staff. PMR is the more specialized of the two with pediatric and geriatric in-patients receiving medical treatment for strokes, cerebral palsy, and traumatic brain injuries. The majority of cases seen by the PMR outpatient pediatric ward are children on the autism spectrum. Within the private sector, there are also multiple facilities that provide services for children with autism, two of which were approached for recruiting participants for this study.

1.1.1 Research in Kuwait

It is important to note that though research publications from the Arab world are produced in three languages, Arabic, English, and French, only papers in English are factored in international databases (Sarhan, 2012). This renders the data presented in this next section as not wholly conclusive. According to Alnemary, Alnemary and Alamri (2017), of the 142 papers published on autism from the Arab world, only 6 come from Kuwait and these cover environmental toxins, treatment outcomes, and genetic studies. A report on the aetiology of autism in Kuwait found that there is little information available to researchers, parents and the general public on the topic despite growing prevalence rates (Fields, 2006). Though the Kuwaiti government has established a center for Autism over a decade ago to provide up-to-date medical care and education for children with ASD, the research field is at best, minimal. Investigations are needed to understand the pattern of health services in Kuwait for children with ASD, the burden of care, the coping of caregivers, prevalence rates and gender ratios, the provision of early screening programmes, and the improvement of parental awareness for early detection and intervention are all called for.

Though the nationality of the participants and their bilingual nature does not have significant bearing on the design of this study, conducting this research in Kuwait is a good catalyst for more research to come from the country and a better understanding of how ASD is presented here.

1.2 AUTISM SPECTRUM DISORDERS

Autism spectrum disorders (ASD) are characterized by impairments in social interaction and social communication, along with patterns of restricted and repetitive behaviors and activities (DSM-5, 2013). The DSM-5 provides a list of symptoms and criteria for a diagnosis of ASD that includes deficits in social-emotional reciprocity such as abnormal social approach, failure to initiate and respond to social interaction or take part in a dialogue, and reduced sharing of interests and emotions. Deficits in nonverbal communication ranges from the inadequate use of verbal and nonverbal communication simultaneously, poor eye contact and body language, deficits in understanding and using gestures, to a total lack of facial expressions and nonverbal communication. Symptoms also include difficulties in developing, maintaining and understanding relationships, such as conforming behavior for social events, the ability to take part in imaginative play, and an absence of interest in peers. Finally, within restricted repetitive behaviors there includes stereotyped or repetitive motor movements in the use of objects or speech, the insistence on a rigid observance to routines, ritualized patterns of verbal or nonverbal behavior, an intense abnormal fixation on highly restricted interests, hyper- or hypo-reactivity to sensory input and unusual interest in sensory aspects of the environment.

ASD is a common, heterogeneous, neurodevelopmental condition affecting approximately 1.5% of children worldwide (Baxter et al., 2015). The definition and criteria for diagnosis has changed over the years with the current DSM-5 providing a distinction of ASD based on clinically observed severity levels determined by the intensity of support an individual needs (Appendix A). For the purpose of this research, the term ASD and autism will be used interchangeably to refer to the population at large regardless of severity, unless stated. In some cases where the research papers cited were published prior to the release of the DSM-5, the diagnostic terms the authors have used will be used to so that findings are reported accurately and to avoid any confusion in regards to who the population was.

1.2.1 Prevalence

The prevalence of ASD has been reported to be on the rise (Masi, DeMayo, Glozier, & Guastella, 2017). In the United States, a high rate of 1 in 59 cases is estimated, representing a 15% increase over 2 years (CDC, 2014). A population study in the UK reports prevalence of childhood autism at 116.1 per 10,000 cases (Baird et al. 2006). Over the span of 30 years, the prevalence in Asia has increased from an average of 1.9 to 14.8 cases every 10,000 (Sun & Allison, 2010). This is a vast difference from the 30-60 cases per 10,000 indicated from 1996 to 2001 encompassing the United Kingdom, United States, Scandinavia and Japan (Rutter, 2005).

In the Middle East, where Kuwait is situated, there is a paucity of studies conducted on ASD prevalence rates. The Gulf Cooperation Council (GCC) includes 6 Arab countries located in the Arab Peninsula: Kuwait, Sultanate of Oman, Qatar, Kingdom of Saudi Arabia (KSA), Kingdom of Bahrain, and the United Arab Emirates (UAE). In addition to a shared geographical location, these countries have similar ethnic backgrounds, lifestyle, and language (with varied dialects). Prevalence data is available for four of the six countries Oman, KSA, the UAE and Bahrain. In Oman, the prevalence rate of ASD was 1.4 in 10,000 (Al-Farsi et al., 2010). Reports from KSA estimate 18 cases per 10,000 (Al-Salehi, Al-Hifthy, Ghaziuddin, 2009). The UAE conducted a prevalence study on preschool children diagnosed with the previously termed pervasive developmental disorder (PDD) and estimated a rate of 29 cases per 10,000 (Eapen, Mabrouk, Zoubeidi, & Younis, 2007). In Bahrain the prevalence of ASD was estimated as 4.3 per 10,000 (Al-Ansari, & Ahmed, 2012).

Three of the studies cited above recruited small samples ranging from 49 to 113 making it difficult to generalise their prevalence rates to the entire population. Though the UAE study had a larger number of recruits at 694, their sample was limited to 3-year old's with PDD, also rendering generalisation difficult. The methods of gathering data for prevalence rates consisted of the use of questionnaires, clinical interviews, child and parent interviews, rating scales and examination of school and hospital records. Only the KSA study used all the above-mentioned methods indicating their findings to be highly reliable, however, only the UAE and Omani studies discuss the reliability measures that were taken. It is important to note that all of the prevalence rates mentioned above are based on the previous DSM-IV and so may not reflect the present prevalence rates based on the new DSM-5.

The ever evolving and more inclusive diagnostic criteria, including heightened awareness of ASD by both professionals and the general public is thought to have played a role in increased case identification and therefore increased prevalence rates (Masi, DeMayo, Glozier, &

Guastella, 2017; Wing & Potter, 2002). Population based surveys also yield higher estimates than studies that use passive data collection techniques (Fombonne, 2009). Furthermore, differences in study design, participant characteristics, and data collection methods may partly explain the prevalence differences between the rates seen in the Arab world and that of the international community (Eapen, Mabrouk, Zoubeidi, & Younis, 2007; Xu, Strathearn, Liu, & Bao, 2018). In the UAE, some cases were reported as having a global developmental delay with autistic features rather than PDD, these were identified through the use of a single screening test without the support of an IQ test, and may have resulted in the misclassification of children and possibly deflating the final results (Eapen, Mabrouk, Zoubeidi, & Younis, 2007). The scarcity of clinics specialized in diagnosing ASD in large geographical areas, may also result in considerable under-diagnosis as families may find it financially and logistically difficult to travel for services, which may explain the low rates coming from Oman (Al-Farsi et al., 2010).

Gender Variability

There is a mean gender ratio of 4.2 males affected with ASD to every 1 female worldwide (Werling & Geschwind, 2013; CDC, 2014; Al-Ansari & Ahmed, 2013; Fombonne, 2009). This ratio decreases as severity increases, i.e. a more equal proportion of males and females are diagnosed with severe ASD (Masi, DeMayo, Glozier, & Guastella, 2017). The male to female ratio in GCC countries is consistent with international studies showing male proclivity. Bahrain reported a ratio of 4 males to 1 female (Al-Ansari, & Ahmed, 2012). Oman and KSA both report a ratio of 3 males to every 1 female (Al-Farsi et al., 2010; Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009).

1.2.2 Aetiology

Genetic Factors

Evidence points towards a strongly genetic predisposition in the etiology of ASD. Twin and family studies have provided significant support in linking genetics to ASD, with monozygotic (identical) twins being two times more likely to have autism than dizygotic (fraternal) twins, and parents of children on the spectrum showing mild traits of autism such as social reserve and communication difficulties, (Colvert, et al. 2015, Sandin, et al., 2014; Pickles et al., 2000). Research has also identified genetic variations, inherited and de novo*,* with rare or common variations related to autism or autistic features (Devlin, & Scherer, 2012; Schaaf & Zoghbi, 2011). Up to 15% of ASD cases can be linked to familiar monogenic syndromes such as fragile X syndrome (Devlin, & Scherer, 2012) while up to 90% of males with Fragile-X syndrome display traits of autism such as atypical social interactions and repetitive or stereotyped behavior (Hernandez et al., 2009). An important risk factor for ASD is polygenic risk, the collective outcome of multiple genetic variants converging on a common genetic pathway (de la Torre-Ubieta, Won, Stein, & Geschwind, 2016). Research coming from the Arab world is again limited. A study from Kuwait exploring genetic links report that 45% of children with fragile X syndrome were autistic (Bastaki, Hegazi, Al-Heneidi, et al. (2004). In KSA, almost 1/3 of children with autism had a history of consanguinity, i.e., the parents are first cousins, suggesting that families should be screened for genetic variations (Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009).

Environmental Factors

Perinatal and prenatal environmental factors have been extensively studied, with high maternal and paternal age, maternal bacterial and viral infection, paternal exposure to pharmacological medicines, and maternal dietary and lifestyle factors all linked to an increased risk of ASD (Idring et al., 2014; Lee, et al., 2015; Bromley, et al., 2013; Kuzniewicz, et al., 2014; Suren, et al., 2013). Environmental chemicals that can interfere with normal neurodevelopment have also been linked to an increased risk of ASD (Talbot, et al., 2015; von Ehrenstein, Aralis, Cockburn, & Ritz, 2014). A model known as the 'Final Common Pathway' was introduced by Baron-Cohen and Bolton (2002) that indicates the combination of four areas of genetic factors, viral infections, birth/pregnancy complications and other causes such as exposure to environmental elements that may alter the central nervous system are all considered to converge to produce autism (Baron-Cohen, & Bolton, 2002; Landrigan, 2010).

Neurophysiology

Macrocephaly and brain growth have long been associated with ASD. A meta-analysis of the current research on this topic yielded that head circumference and brain size was significantly larger in autistic individuals, with evidence pointing towards a variation of abnormal brain growth with age (Sacco, Gabriele, & Persico, 2015; Lyall et al., 2017). Neuroimaging studies have also identified neuroanatomical abnormalities associated with cognitive, social and behavioral impairments (Owen et al., 2017).

1.2.3 Comorbidities

There are various comorbid disorders in the ASD population. Epilepsy, sleep, immune system irregularities and gastrointestinal disorders are some of the medical conditions commonly associated with autism (Cortesi, Giannotti, Ivanenko, & Johnson, 2010; Chaidez, Hanson, & Hertz-Picciotto, 2014; Perrin, Erickson-Warfield, Zwaigenbaum, 2016; Croen, et al., 2015; Matson & Cervantes, 2014). Mental health conditions also frequently accompany autism with 30% reported to have an intellectual disability, and 30-40% have attention deficit and hyperactivity disorder (Christensen, et al., 2018). In a study of structured assessments on a UK population-based sample, 70.8% of children presented with at least one psychiatric disorder (Simonoff et al. 2008). The most common of these disorders were social anxiety disorder (29.2%), ADHD (28.1%), and oppositional defiant disorder (28.1%). Other disorders found in less than 10% of the children included 13.4% with generalised anxiety disorder and 10.1% with panic disorder. Major depressive disorder had a low rate of 0.9%.

In KSA 44.8% of case referrals were due to behavioral problems including hyperactivity and aggression; 22.4% had a history of seizures (Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009). From Egypt, reports show that 50% of patients are hyperactive, 5% have epilepsy and 71.4% present with psychiatric comorbid disorders (Hussein, Taha, & Almanasef, 2011). A 2011 paper on comorbid psychiatric disorders in Arab children from three countries, Egypt, KSA and Jordan found that within a sample of 60 children diagnosed with ASD, 31.6% had ADHD, 23.3% had a conduct disorder and 58.3% were diagnosed with anxiety. The most prevalent anxiety disorder was obsessive-compulsive disorder with 55% of children being affected, followed by specific phobia at 40%, generalised disorder at 10% and separation anxiety at 8.3% (Amr et al., 2012).

Their paper also explored associations between IQ and comorbid psychiatric disorders and children with a significantly lower IQ were found to have a higher incidence of comorbid psychiatric disorders compared to those with a higher IQ. In can be concluded that though the studies that have been published regarding the presentation of autism in the Arab world are limited, a trend with the international body of research can be seen. That being said, a majority of the papers cited are community-based samples with participant recruited from clinics. These types of referrals are considered as biased compared to population- based surveys (Kim et al. 2011).

1.3 TREATMENT OPTIONS IN AUTISM

Though the economic and societal costs of ASD are well documented, treatment options that target both the core symptoms of ASD and associated comorbid mental and medical conditions remain limited. Furthermore, the genetic, cognitive, environmental and social heterogeneity of the ASD phenotype makes identifying effective treatments for ASD a challenge. Results reported in research are extremely diverse, diminishing the effect size of an intervention (Siegel & Beaulieu, 2012). Cross-cultural diagnostic differences, one of which is averted eye gaze, may be considered deviant in one culture and not another, confounds universal diagnostic and treatment options (Freeth, Sheppard, Ramachandran & Milne, 2013).

There are various psychologically based programmes that aim to enhance cognitive and behavioral functioning in individuals with autism. These include programmes such as cognitive-behavioral therapy that target mental health problems. Communication-based programmes can support the child directly in communicating at a level specific to him/her whether they are verbal or non-verbal, or support parents in improving how they communicate with their child. Programmes that focus on social/emotional competence use joint attention, symbolic play, social skills groups, social stories, as well as targeting deficits in theory of mind to improve the core deficits of autism. Finally, there are behavioral programmes that target deficits in behavior such as social avoidance and aggression; and parents are required to play a primary role to ensure the generalisation of targeted behaviors (Howlin, 2010).

Early childhood treatment focuses on behavioral interventions that are based on the principles of Applied Behavioral Analysis (ABA) despite its high expense and the required intensive use of resources making it inaccessible for many children with ASD (Eldevik, et al., 2009). A meta-analysis of ABA programs revealed that these interventions result in a high effect in improving intellectual abilities, and communication skills and moderate effect in improving IQ, adaptive behavior and socialisation (Makrygianni, Gena, Katoudi, & Galanis, 2018). Another meta-analysis that reviewed over 400 published papers on the various treatments available for individuals with autism regardless of age found that foundational applied behavioral analysis methods such as prompting and reinforcement had the most empirical support towards their effectiveness (Wong et al., 2015). However, the research on this area comes with drawbacks of weak methodology, few participants and short-term follow-ups (Ospina, et al., 2008; Spreckley, & Boyd, 2009).

Pharmaceuticals are also used for children and adolescents to treat symptoms associated with ASD such as aggression, self-injury, and tantrums. Conversely, a multitude of side effects persist alongside these medications not limited to weight gain, drowsiness, sedation, fatigue, and tremors (Anderson, et al., 2007; Robb, et al., 2011). A systematic review of medical interventions for challenging and repetitive behaviors, found negligible evidence to support most treatments for children aged 12 years and younger (McPheeters, et al., 2011). However, there are gaps in the available knowledge on focused intervention methods for individuals with autism. A deeper understanding of the heterogeneous nature of ASD, while taking into account comorbid disorders and cultural factors, would precede this. Though it is a heavy undertaking, there is a shift towards using objective measures of response, such as genetic biomarkers, as opposed to the classical subjective measure of observation (Masi, DeMayo, Glozier, & Guastella, 2017). Additionally, understanding the cognitive foundations that lead to the manifestation of the core symptoms of autism, particularly deficits in language and narratives, offers a framework towards exploring these difficulties and may pave the way for more tailored, thus more successful, intervention programmes.

1.4 COGNITIVE THEORIES OF AUTISM

Various theories aiming to understand the symptomatology of autism have surfaced over the years that also provide explanations towards the developmental trajectory of narrative language in individuals with autism. Three primary categories of social and cognitive theories that are linked to language development and narrative production, have proposed links between autistic brains and exhibited behavior, Theory of Mind (ToM), Executive Function (EF) and weak central coherence theory (WCC) (Rajendran & Mitchell, 2007). Though all three theories have been decades in the making, neither one theory is fully satisfactory on its own. Non-social theories such as WCC fail to fully explain social and communicative impairments, while theories of a social cognitive nature such as ToM and EF do not comprehensively address the rigidity and repetitive behaviors seen in ASD (Weismer, Kaushanskaya, Larson, Mathee, & Bolt, 2017). It has been put forth that a multi-cognitive approach may be pertinent towards understanding the various aspects of narrative, in that ToM should relate most strongly to socio-communicative symptoms of autism, EF to non-social repetitive behavior and WCC to the uneven cognitive profile, talents and restricted interests (Brundson & Happé, 2014). Furthermore, with existing tests of advanced theory of mind such as Reading the Mind in the Eyes Task (Baron-Cohen, Wheelwright, Scahill, Lawson, & Spong, 2001) and the Faux Pas Test (Baron-Cohen, O'Riordan, Stone, Jones & Plaisted, 1999) – further discussed in Chapter 4, researchers are able to measure how well children with ASD can recognise and infer cognitive and emotional states of themselves and others which has significant bearing on what this study is exploring and will be further elaborated on below.

1.4.1 Theory of Mind

Children with autism face severe social, communicative, and imaginative challenges on a daily basis. A social-cognitive theory that gained popularity in the mid-80's proposed that the above core elements of ASD may be attributed to a primary cognitive deficit and was coined Theory of Mind (ToM) (Baron-Cohen et al., 1986). ToM is the ability to attribute the cause of an action by surmising mental states from one's own mind and that of others' such as their beliefs, intentions, desires, and emotions (Baron-Cohen, 2001). By 3 years of age, children are able to identify that actions and preferences are subject to a person's desires and by 5 years, they appreciate that a person may hold a false belief about an event in the world, and that this knowledge may be used to correct or predict a person's action (Wellman, Cross & Watson, 2001). A systematic review that examined the precursors to the development of ToM across the lifespan in TD individuals

(Derksen, Hunsche, Giroux, Connolly, & Bernstein, 2018), found that attention skills (Brooks & Meltzoff, 2015), Executive Function (EF) (Devine & Hughes, 2014), early language ability (Atkinson, Slade, Powell, & Levy, 2017), and the early social environment i.e., the relationship that exists between a child and their parent and older siblings (Prime, Plamondon, Pauker, Perlman & Jenkins, 2016), uniquely predict ToM development.

There has been debate about ToM abilities in children with ASD where early findings indicated significant delays compared to TD ones (Tager-Flusberg, 1999). The most widely used test of ToM is Wimmer and Perner's (1983) test of first-order false belief where one person must infer the mental state of another (I think he thinks). Early research presented conflicted findings where up to 80% of children with an average age of 11 years with autism were found to fail first order false belief tasks (Baron-Cohen, Leslie, & Frith, 1985) and those who do pass it are still unable to attribute beliefs at a more advance level (I think he thinks she thinks) indicating a deficiency in ToM (Baron-Cohen, 1989). Compared to typically developing children, who pass the first order tasks at around 4 years of age and second order tasks around 7 years of age (Perner & Wimmer, 1985; Baron-Cohen, 1989), this is a substantial delay. 73% percent of young adults with Asperger Syndrome, on the other hand, were found to be able to pass second-order false belief tasks (Bowler, 1992). This was later explained to be a result of the strong association found between verbal mental age and performance on false belief tasks, where individuals with autism and a verbal mental age of 12 and above were almost certain to be able to pass these tasks (Happé, 1995). It has been suggested by a training study that the development of TOM may be preceded by the development of language skills (Hale & Tager-Flusberg, 2003), indicating that those with more severe language difficulties may present with poorer TOM skills. This also questions the tests designed to measure ToM that require the comprehension of language which are further discussed later.

To better understand the development of ToM skills, advanced tests of ToM were designed including The Strange Stories Test (Happé, 1994), Reading the Mind in the Eyes Task (RMET) (Baron-Cohen et al., 2001) and the Recognition of Faux Pas Test (FPT) (Baron-Cohen et al., 1999). These tasks were developed to assess children's abilities to deal with higher order representations of intentions, emotions, and beliefs using explicit language-based reasoning or the perceptual interpretation of nonverbal behavior through facial expressions (Baker, Peterson, Pulos, & Kirkland, 2014). However, advanced ToM tasks do not measure an element that is principle to ToM; the ability to combine a person's understanding of the causal relationship between informational access and the consequent state of belief. To solve this problem, a new term "mindreading" or "empathizing" was introduced that refers to the development of emotion and recognition skills from childhood to adulthood and is considered to be a part of ToM (Wellman, 1992; Baron-Cohen, 2002; Golan & Baron-Cohen, 2006). As the two latter tests of RMET and FPT pertain to this study, they are briefly discussed next and extensively in Chapter 4.

Reading the Mind in the Eyes Task (RMET)

The RMET was designed to measure complex emotion recognition such as arrogant, or scheming by way of black and white photographs of the eye region of people's faces (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997). Individuals are required to put themselves into the mind of the person they are looking at in a photograph and attribute the relevant mental state to them (Vellante et al. 2012). It requires the use of multiple cognitive processes including face perception, language and emotion competence (Baker et al., 2014; Barrett, Lindquist, & Gendron, 2007; Beck, Kumschick, Eid, & Klann-Delius, 2012). Early studies indicate that individuals with ASD perform significantly more poorly compared to clinical and TD groups (Baron-Cohen et al., 1997). More recent claims suggest that this is not the case after participants with ASD performed similarly to TD peers on the RMET (Back, Ropar, & Mitchell, 2007). They were however, measuring emotion recognition using dynamic faces and not static ones as the original study did, raising questions about the presence of a ToM deficit in people with an ASD.

In a meta-analysis of children with autism examining their performance on ToM tasks, there was a significant correlation between RMET performance and performance IQ (PIQ), but not with age or verbal IQ (VIQ), (Peñuelas-Calvo et al. 2019). Previous studies have found similar results in terms of age and IQ (Brent, Rios, Happe, & Charman, 2004; Peterson, Slaughter & Brownell, 2015). However, the systematic review above did not include studies with participants with an intellectual disability and had a sample range from 6 to 60 years. Other studies that had included individuals with an intellectual disability aged from 14 to 16 years did find a correlation with IQ (Hollocks et al. 2014).

Faux Pas Test (FPT)

The FPT is a series of 10 stories designed to assess the ability of people with autism to detect a faux pas, i.e., when someone unintentionally says something that may offend the listener (Baron-Cohen, O'Riordan, Stone, Jones & Plaisted, 1999). Research indicates that individuals with autism perform at a significantly lower level on the FPT compared to TD peers (Katyal, 2015;

Romer, Ravitch, Tom, Merrell, & Wesley,2011; Kuhnert, Begeer, Fink & de Rosnay, 2017). These results led researchers to conclude that a deficit in ToM in people with autism does exist.

ToM and Autism

When viewed globally, ToM does not provide a conclusive explanation of the socio-cognitive impairments seen in autism due to the conflicting results in the field (White, Hill, Happé, & Frith, 2009; Beaumont & Sofronoff, 2008; Scheeren, de Rosnay, Koot, & Begeer, 2013); shifting its role from a core deficit to a developmental delay not universally seen in autism (Ozonoff, Pennington and Rogers, 1991). It has been speculated that ToM exists on a continuum, where children with autism vary in their skills, depending on verbal abilities and general reasoning capacity during different stages of growth (Scheeren et al., 2013). Furthermore, the performance of people with autism on theoretical tasks that test their social cognitive reasoning skills does not indicate a direct translation to everyday life. Parents report everyday mindreading problems in their child with autism, even after the child passes a first-order ToM task (Peterson, Garnett, Kelly, & Attwood, 2009). However, it should be noted that the sample sizes and ages used in most of these studies were not large or varied enough to fully represent the heterogeneous nature of ASD and as such should be interpreted with caution (Derksen, Hunsche, Giroux, Connolly, & Bernstein, 2018; Peñuelas-Calvo, Sareen, Llewellyn-Jones, & Fernández-Berrocal, 2019).

1.4.2 Executive Function

Executive function (EF) is considered a domain-general cognitive deficit, with a broad and varied definition. EF consists of related but separable subcomponents, the core of which includes inhibition, the ability to suppress attention to extraneous information; task shifting, the ability to effortlessly switch between thoughts and actions and lastly, the updating of working memory (WM) which involves integrating novel information into the WM (Friedman, et al., 2008; Miyake et al., 2000; Vaughan, & Giovanello, 2010). These three core components combine in manifold ways to create higher-level executive functions such as planning, problem solving, organisation and reasoning (Diamond, 2013). All these factors highlight the importance of EF in learning, academic achievement, emotional regulation, and social competence that have a profound impact on overall quality of life issues across the life span (Best, Miller, & Naglieri, 2011; Blair & Razza, 2007; Broidy et al., 2003; Ferrier, Bassett, & Denham, 2014; Moffitt et al., 2011).

In the ASD population, children have exhibited significant difficulties on tasks that measure the three main components of EF, inhibition, tasking shifting and updating of WM (Christ, Holt, White, & Green, 2007; Pellicano et al., 2017; Russo et al., 2007; Semrud-Clikeman, Fine, & Bledsoe, 2014; Joseph et al., 2005). Other studies have recorded difficulties on higher-order EF tasks in planning, problem solving, organisation, and reasoning (Diamond, 2013; Joseph et al., 2005; Pellicano, 2010). A meta-analysis on 235 studies evaluating the role of EF in autism showed consistent evidence of a moderate effect size of executive dysfunction in autism across individual domains (Demetriou et al., 2017). It has also been suggested that EF deficits observed in children with ASD are tied to core autism symptoms, as group differences on EF performance tasks between TD and ASD children were no longer found once social communication abilities were controlled for (Weismer et al. 2018).

EF and Language

There are empirical findings supporting a link between EF and language within the ASD population. Akbar et al. (2013) showed that language, nonverbal cognition, and autism severity were significant predictors of organisation, shifting and WM, supporting an association between language and EF. Similar results were found by Weismer et al, (2018), who reported a modest association between mostly receptive and expressive language and EF skills. Joseph, McGrath, and Tager-Flusberg (2005) report conflicting evidence where the control group revealed significant associations between EF tasks and language but not in children with autism. In another study that matched ASD, TD and SLI children on vocabulary level, the children with ASD did not display EF deficits on measures of shifting or updating WM (Haebig, Kaushanskaya, & Ellis Weismer, 2015).

Multiple factors play a role in the inconsistent findings to date on the role of EF in ASD including participant heterogeneity, the different tasks that have been used to measure EF skills, and the designs of the tasks themselves. Some tasks require verbal stimuli while others do not and none of the tasks are designed to be used by one specific cognitive process resulting in the overlapping of affected areas (Demetriou et al. 2018; Weismer et al., 2018).

1.4.3 Weak Central Coherence (WCC)

Weak Central Coherence (WCC) theory was initially proposed as the basis of impairments seen in ASD, accounting for the social aspects seen in autism such as the acute attention to detail (Frith, 1989, 2003). Central Coherence is a system of normal information processing that involves the gathering of data from various sources and pooling them together to elucidate a higher-level meaning in context. Frith and Happé (1994) initially suggested that children with ASD are particularly good at processing finer details i.e., local coherence, yet generally fall short of global coherence, i.e., combining the information together, indicating a deficit in this domain-general process.

Central coherence was first explored through perceptual processing, where studies evidenced that children with autism performed significantly better in finding embedded target figures within complex figures (e.g., finding a circle shape in a picture of a house) and were also faster than their typically developing peers at assembling identical images of 2-D pictures using red and white blocks (Shah & Frith, 1983, 1993). According to Frith (1983), TD people are driven towards combining the sum of the parts to achieve the whole, whereas people with autism lack a cognitive drive to assimilate information towards a global construct thereby evidencing weak central coherence. These results were inconsistent with others that did not observe performance differences children with autism and TD children on these tasks (Ozonoff, Pennington, & Rogers, 1991; Brian & Bryson, 1996).

WCC has also been explored as a causal identifier to language problems in ASD. Though individuals with autism are able to comprehend single words, their comprehension of phrases is not fully intact (Prior & Hall, 1979), they tend to score lower on comprehension tests than reading tests (Frith & Snowling, 1983; Lockyer & Rutter, 1969; Rutter & Bartak, 1973), they show difficulty in extracting meaning from spoken language (Tager-Flusberg, 1981), they do not spontaneously integrate information to make inferences (Nuske & Bavin, 2010), and they are less likely to consciously refer to sentence context on linguistic tasks when presented with homographs (2 words that are spelt the same but are pronounced differently and have different meanings) (Frith & Snowling, 1983; Happé1997; Jolliffe & Baron-Cohen, 1999). The above presentation of WCC within language may account for some of the social difficulties present in autism, as these abilities are required to comprehend communication intent beyond the surface structure of language (Rajendran & Mitchell, 2007).

However, based on all previous studies, detecting WCC in people with autism seems to depend on the type of task being used whether it is verbal or visual, or a combination of both. Lopez and Leekam (2003) assessed children with autism on their ability to process both verbal and visual context information and found no evidence for WCC in their visual tasks but a specific difficulty with complex verbal stimuli. Norbury (2005) compared the comprehension of lexical ambiguity in people with autism with and without co-morbid language impairment. Their results indicate that problems with complex verbal stimuli such as ambiguous language were only present in those with autism and a co-occurring linguistic difficulty. It can be concluded from these results that WCC is not a universal deficit in autism.

Modern Account of WCC

Over the decades, the central coherence (CC) theory has continued to evolve. According to the modern account of CC, people with ASD possess superior local perception as well as intact global integration (Booth & Happé, 2018). They are able to globally process information, yet they have a natural preference towards using local processing skills and are relatively slow in globally integrating these features into consequential and contextually appropriate representations (Baron-Cohen, 2002; Koldewyn, Jiang, Weigelt, & Kanwisher, 2013; Wang, Mottron, Peng, Berthiaume & Dawson, 2007). The theory has also progressed from one that aims to comprehensively explain the symptoms of autism to only accounting for specific cognitive deficits in autism (Happé & Frith, 2006).

1.4.4 Cognitive Theories and Language

The levels of difficulties in EF may considerably affect the developmental outcomes of children with autism including their social competence, which involves the use of ToM in social situations; their adaptive behavior, which accounts for the ability to function independently in real-life settings, and their academic achievements, all of which provide grounds that differences in emerging EF skills may account for the heterogenic nature of autism (Pellicano, 2012). Additionally, research supports a strong relationship between ToM and EF, in that EF skills predict later ToM but early ToM skills do not predict later EF skills supporting the impression that EF is vital to developmental changes in ToM (Hughes, 1998; Hughes & Ensor, 2007; Carlson, Mandell, & Williams, 2004).

Based on the findings to date, the current theories do provide explanations of many of the three core symptoms of ASD, yet neither one can individually explain every trait of ASD, giving rise to a multiple-deficit account of autism (Baron-Cohen & Swettenham, 1997; Joseph, Tager-Flusberg, & Lord, 2002). This account was supported by Pellicano, Mayberry, Durkin, and Maley (2006), who found the domains of ToM, EF, and CC to be independent of each other when age, verbal and non-verbal abilities were controlled for.

Within the spectra of this study, the local processing highlighted by the CC theory accounts for people's ability to detect miniscule emotions on a persons' face (Kaufman & Kaufman, 1983), while global processing allows the combination of various details to make sense of sentences and social interactions (Happé, 1997). Therefore, this cognitive perceptual deficit in global information processing may in turn supplement the social deficits in autism (Jarrold, Butler, Cottington, & Jimenez, 2000). The ToM hypothesis describes social impairment in autism as an inability to engage in metarepresentation (Leslie, 1987), resulting in an inability to attribute mental states to the self and to others hindering the development of social cognition and ToM itself (Baron-Cohen, 1989; Leslie & Frith, 1988; Reed & Petterson, 1990). This also complicates social situations and the development of appropriate social skills for individuals with autism. EF deficits, in turn, encumber good organizational skills and the ability to focus one's attention that is needed to express the temporal and causal sequence of events that a person wishes to share with others affecting social competence, adaptive behavior, and academic achievements (Pellicano, 2012; Rajendran & Mitchell, 2007; Robinson, Goddard, Dritschel, Wisely, & Howlin, 2009). Additionally, language is seen as the medium through which higher-order rules are formed; therefore deficits in language may also affect the development and expression of EF (Rueda, Fan, & McCandliss, 2004; Rueda, Posner, & Rothbart, 2005; Zelazo, Muller, & Frye, 2003).

Part 2 – Narratives

1.5 LANGUAGE IN AUTISM

This section provides a review of language and communication impairments and the role they play within anxiety disorders in children with ASD. The significance of narrative skills within pragmatics will be highlighted as well as an evaluation of narrative assessment techniques.

Communication impairments have long been recognized as a core feature of ASD with 30-40% of the population existing as nonverbal or not having functional speech (Tager-Flusberg, Paul & Lord, 2005) while others though delayed, do become verbally fluent (Mayo, Chlebowski, Fein, & Eigsti, 2012). Individuals with ASD who require low support and are verbal, have been shown to have significant delays in expressive phonological skills (the production and understanding of different patterns of speech sounds), vocabulary (the correct use and understanding of words), and grammar (the combination of words and morphemes into phrases) yet with time and intervention may perform at a level average to their peers (Eigsti, Bennetto, & Dadlani, 2007; Rapin, Dunn, Allen, Stevens, & Fein, 2009).

Another defining feature of ASD is pragmatic language difficulties which involves the ability to appropriately use language within a social context while accounting for the knowledge and interests of the listener (Diehl, Bennetto, & Young, 2006). Having reduced pragmatic language skills may increase social misunderstandings and reduce successful communication resulting in negative social interactions, as it is through communicative social experiences that one may understand the intent of a speaker who is being sarcastic, overly formal, polite or hostile (Mundy & Markus, 1997).

1.5.1 Pragmatics

Pragmatics is a domain of language that requires the simultaneous comprehension and production of speech, and encompasses the frequency of communication, discourse skills such as turn-taking, topic introduction, maintenance and change, stylistic variation for different listeners and social situations as well as nonverbal aspects such as gesture, body language, facial expression and eye contact (Paul, 2007). Ultimately, it is the ability to use language appropriately in real life conversations, i.e., social communication. This is defined as a dialogic discourse type of oral language where two or more individuals participate in back and forth communication (Sacks, Schegloff, & Jefferson, 1974). It is highly contextualized due to a shared social, temporal and physical context between the individuals, resulting in less detailed, casual oral language (Petersen, 2011).

When considering receptive pragmatic skills, children with ASD are documented as having an overly literal comprehension of language, with difficulties in understanding gestures, body language and humor, and unusual emotional interpretations (Happé & Frith, 1996; Loveland et al., 1997; Martin & McDonald, 2003; Ozonoff & Miller, 1996). Expressive pragmatic deficits are marked by limited use of facial expressions and gestures, lack of conversational reciprocity, reduced social instigations and prosody, lack of cohesion in discourse, and referential difficulties related to the inappropriate use of pronouns (Martin & McDonald, 2003; Happé & Frith, 1996; Lord, Rutter, & LeCouteur, 1994).

The linguistic features of pragmatics denote the use of language as a form of communication that produces and regulates effective discourse (de Villiers, 2004). This involves three factors; the communication of intentions, making inferences about what the listener does or does not know, and lastly, the regulation and structure of discourse that includes among other things, oral narratives (Stockman, Karasinski, & Guillory, 2008, Atlas, 2004).

1.5.2 Narratives

The ability to connect language with the intent to participate in conversations, share ideas, recount experiences, provide explanations, or construct imaginary stories is an important developmental achievement that signifies a child's growing capacity to use language (Boudreau, 2008). Intact narrative discourse skills are considered especially fundamental for academic and social success, and their use in language assessment and intervention are invaluable (Botting, 2002; Norbury & Bishop, 2003).

Two elements work towards a person producing successful narratives; the first involves being able to monitor and maintain the involvement of the listener (Ochs & Capps, 2001), the second involves being able to empathetically relate to the emotions, thoughts, and actions of people. This requires the use of linguistic, cognitive, and social-cognitive abilities simultaneously

(Bamberg & Damrad-Fyre, 1991). Engel (1995) elaborates that a self-portrait is built with every story told by a child that they can later explore, reflect upon and alter and it is this portrait that allows people to better understand each other. Narratives are therefore not only tools of communication, but also a way to make sense of ones' own experiences and relationships. Experiences that may otherwise appear to be unrelated can be connected using narratives and shared with others as a personal identification of self.

Macrostructure and Microstructure

In contrast to conversations, narratives are a monologic type of discourse delivered almost exclusively through language (Snow, 1991), requiring a narrator to convey a story to a listener who lacks details about the context of said story with significantly reduced participation. This indicates that narrative language requires the use of macrostructural and microstructural elements that enrich the intricate story being delivered and is based on advanced language skills, and examining these elements provides a measure of narrative competence (Petersen, 2011). Listening to stories and telling ones' own stories involves the knowledge of story grammar, a general script on how the story would proceed, and an opportunity to practice all parts of oral language including speech, vocabulary and grammar (Paul, 2007). Narratives also play a significant role in the development of inferencing skills about details not stated explicitly, i.e., the ability to read between the lines (Kleeck, 2008).

Story grammar and episode complexity provide an indication of macrostructure (Petersen, Gillam, Spencer, & Gillam, 2010). The story grammar framework outlined by Stein and Glenn

(1979) is considered the foundation upon which to compare other narratives. These elements include the setting, initiating event, internal response, plan, attempt, consequence and resolution (Stein & Glenn, 1979). From these elements, only three are needed for a minimally complete narrative episode, an initiating event, one or more attempt(s), and a consequence (Peterson & McCabe, 1983). Within microstructure, a more detailed approach is required. Measures collectively referred to as literate language within narratives allow for the analysis for the use of causal and temporal subordinating conjunctions, coordinating conjunctions, adverbs, elaborated noun phrases, mental and linguistic verbs, specific noun and pronouns (Nippold, Ward-Lonergan, & Fanning, 2005; Greenhalgh & Strong, 2001; Strong & Shaver, 1991). Measures of language productivity include the number of utterances (C-units), total number of words (TNW), mean length of utterance (MLU), and number of different words (NDW).

Narrative Development

At around 3 to 4 years of age, children shift their use of language from merely conversational to storytelling (Stadler & Ward, 2005). There are several factors that highlight the significance of this narrative development. Firstly, narratives are considered a useful tool in the development of oral language, as stories, unlike daily conversation, require the use of more complex language (Morrow, 1985). This includes the use of precise vocabulary, pronouns, and temporal connectives (when, so, then) to better describe an event to a listener, who was not there. Secondly, this development of higher language paves the way for literacy skills (Hedberg & Westby, 1993; McCabe & Rollins, 1994), reading studies (Feagans & Applebaum, 1986), and ultimately academic success (Bishop & Edmundson, 1987). Finally, to tell a good story, children must be knowledgeable about temporal and cause-effect relationships and theory of mind, linking narratives to a child's development of concepts (Applebee, 1978).

A developmental narrative style is clear early on where very young children produce fewer different words (Miller, 1991), shorter story lengths (Leadholm & Miller, 1995), less complex syntax (Gillam & Johnston, 1992), and less complex or partial story grammar than their older peers (Peterson & McCabe, 1983; Shapiro & Hudson, 1991). After studying the stories constructed by children aged 2 to 6 years following the request to "tell a story", Applebee (1978) first outlined six basic types of narrative structures: heaps, sequences, primitive narratives, unfocused chains, focused chains, and true narratives. Table 1.1 discusses the levels of narrative development in more detail with the examples listed taken from Hedberg and Stoel-Gammon, (1986).

Table 1.1

Applebee's Six Levels of Narrative Development

Stage	Age (years)	Description	Example
Heaps (Prenarrative)	2	Unrelated labels and descriptions of events or actions lacking a central theme or relatedness	
	Example	*A dog is walking down the street. A cat is fighting the dog and a baby is crying. The baby is sleeping. The boy is playing on the swing. The man is lying down and the girl is jumping the jump rope. The lady is cooking chocolate chip cookies. A girl is going to the store. The man is going into the supermarket. The old man is fighting the other man. That's all.*	
Sequences (Prenarrative)	2 -3	Arbitrary links are formed between elements such as characters, setting or topic	
	Example	*She lives with her dad. She lives with her mother. Grandma*	

		and Grandpa live together. And these three children live with their grandma. And these two animals live with them.
Primitive Narratives	3 – 4	Stories include characters, setting and a topic, with a central theme that includes cause and effect relationships
	Example	*My dad, he went up to go to work. My mum stayed and sleep in. My two brothers, they went to go play with the toys. My dog, she went outside. My kitty cat came up and he tickled me and came up and started to meow. And then I started to cry because he bit me. And my brothers came runnin' in and Mike said, "What happened?" They said, "What happened?" "My kitty cat just bit me." So mum comes runnin' in and she said, 'What happened? Oh, the kitty cat bit you. O.K."*
Unfocused chains	4 – 4.5	Includes a sequence of events with no consistency in a central character or theme.
	Example	*This man is walking. He saw a dog and a cat and he saw a girl too, with the cat and the dog. He said "Hello". He walked back and he said, "Brother come here." So her grandmother walked up to her and said, "You wanna go dancing?" They went dancing. And so it was a slow dance. And then they went back. And then these two children came. And then first he said, "I'm not". And then he said, "What?" "I wanna go out to eat." So they went out to eat.*
Focused chains	5	Stories include relevant elements such as characters, setting and a topic. Stories are told in a logical sequence. Yet listener still needs additional information to interpret the ending correctly.
	Example	*Once upon a time there was a mother named Christie. She had a husband named Tom. And they had some children named Heather and Christie. And then they had a boy named Ronnie. And the mother told the boy to go outside and play. And then the boy came in and said, "Mother, mother, our dog's outside and he's barking. I will go see. What are you barking at? I don't know what he was barking at, Tommy, Ronnie, Ronnie. I don't know what he was barking at. You go out there and see. He wants in. I'll go let him in. There, I let him in."*
True Narratives	6 – 7	Stories contain a true plot, with a problem that is resolved in the end. It has a logical sequence of events including character development by connecting motivations and goals of the character with the plot.
	Example	*One day there was a boy named Bobby and a girl named Sharon. They found a cat in their front yard and they brought it into the house. They fed the cat and they gave it some milk. They played and played with it and then a little while after a lady called and asked if anybody had seen her cat. And then they said that they had it at their house. And they brought it to the lady's house.*

Narrative development does not end at 7 years of age though. Between 7 and 11 years of age, children can consider a story in its entirety and summarise and categorise it (Applebee, 1978). From 11 to 12 years of age, complex stories are being produced with multiple embedded narrative structures. Adolescents from 13 to 15 years of age are proficient at analysing stories and conveying an opinion on complex story elements. From 16 years onwards, a sophisticated analysis is present that allows individuals to generalise about the story's implication, communicate conceptual statements about the message or theme and evaluate how they themselves are feeling about the story (Larson & McKinley, 1987).

Narratives and Autism

Narratives have long been used to provide detailed accounts of language abilities, and recently more research has been looking into the narrative comprehension and production skills of children with ASD (King, Dockrell & Stuart, 2014, Norbury, Gemmel, & Paul, 2013). It is understood that with the development of language skills over time, narratives of typically developing children increase in length, have a richer vocabulary and more advanced grammar (Botting, 2002). Though in some cases children and adolescents with ASD have been found to produce narratives similar in length, structure and syntactic complexity to the TD population (Diehl, Bennetto, & Young, 2006), they do relate fewer story grammar units, while adding details to their narratives that are irrelevant, struggle with the use of pronouns, have a narrow or unconventional vocabulary, and use less causal references (Losh & Capps, 2003; Rapin & Dunn, 2003; Lake, Humphreys, & Cardy, 2011; Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008).

Internal state language (ISL) is the vocabulary used to indicate what the perceptions of another person are as well as their thoughts and feelings. These are analysed from narratives to indicate how much insight the speaker has into the mental states of others. Results on the use of ISL terms within the ASD population have been varied; some studies report narratives with fewer mental state verbs (Losh & Capps, 2003; Tager-Flusberg, 1992; Siller, Swanson, Serlin, & Teachworth, 2013), whilst others have found no group differences (Capps, Losh & Thurber, 2000; Norbury & Bishop, 2003). Despite this, children with ASD are less able to causally relate why a character is feeling or thinking a specific way even if the number of mental state terms they have used are similar to TD peers (Beaumont, & Newcombe, 2006; Capps et al., 2000).

Several studies have also identified specific impairments seen in the narratives of the ASD population linked to theory of mind deficits. These include pragmatic violations, the inability to consider the listener's needs, the inability to use markers of time and place, incoherent narratives, and a reduced use of causal expressions, evaluative techniques and mental state language (Diehl et al., 2006; Losh and Capps, 2003; Loveland et al., 1997; Landa & Goldberg, 2005). Furthermore, when compared against TD peers, children with ASD use more ambiguous references and include bizarre and irrelevant details in their narratives (Losh and Capps, 2003; Solomon, 2004).

Narrative Assessment

Described as one of the most interesting and ecologically valid ways in which to measure communicative competence in clinical and TD populations (Botting, 2002), the use of narratives in the assessment of language skills has been widely reported. Sensitive to both the pragmatic and structural aspects of language abilities, narratives underlie many childhood speech interactions, facilitating the extraction of copious amounts of information from them (Botting, 2002; Norbury & Bishop, 2003). They also show areas of deficit that standardised tests do not (Manhardt & Rescorla, 2002). Errors in morphological marking, and maze behaviors are more likely to be produced by students in narratives than in conversations (Hadley, 1998). The narrative measures of MLU and NDW have also been used to differentiate between TD and language impaired children (Gillam & Johnston, 1992; Watkins, Kelly, Harbers & Hollis, 1995). Additionally, narrative measures were more specific in detecting poorer expressive skills than standardised language tests in children with ASD compared to peers with SLI (Manolitsi & Botting, 2011). These factors support the use of narrative assessments to highlight language deficiencies.

Three types of narratives have been identified as being appropriate to use within clinical settings to evaluate language performance: personal narratives involve asking the child to recount a salient personal experience such as a time where they were scared or solved a problem; script narratives involve relating a routine series of events such as the steps to order food at a restaurant; and fictional narratives require the child to generate a story of their own or to describe the plot of a TV show they enjoy watching (Hughes, McGillivray, & Schmidek, 1997). Though story generations are usually the most difficult to produce, they are the closest representation to a real conversation, providing a more accurate depiction of language skills (Paul, 2007) with one paper recommending that story generations be used in clinical practice due to their ability to produce longer utterances than conversation or freeplay (Southwood & Russell, 2004) and another suggesting the use of narrative speech to elicit longer samples, whilst conversations better reflect linguistic complexity (Mirsaleh, Abdi, Rezai, & Kashani, 2011). The use of conversational analysis to study spontaneous communication has not always been useful in part due to the difficulty in controlling the researcher who often eases the pragmatic burden of the child being assessed and the use of narratives remove this factor from the analysis (Bishop & Adams, 1989). Finally, though more formal than conversation, narratives do require pragmatic skills, and merge structured and imaginative communicative techniques in generating stories from pictures (Botting, 2002).

The methods used differ in design and quality; some studies have focused on narrative retell, asking a child to retell a story that has recently been told to them by an examiner, whilst others combine narrative retells with personal generations, i.e., asking a child to narrate a personal story from memory of a generic experience, such as going to the dentist or playing in the park (Swanson, Fey, Mills, & Hood, 2005; Davies, Shanks, & Davies, 2004). Children with ASD are more verbally restricted in their personal narratives than when using storybooks (Losh & Capps, 2003). Generation of stories from pictures may provide an ideal mixture of structured but imaginative communication (Botting, 2002). Other studies have employed wordless picture books, the most popular being the Meyer series of frog stories (Baixauli, Colomer, Rosello, & Miranda, 2016), cue cards, role-playing, and story drawings while targeting specific narrative aspects of story grammar and linguistic complexity.

Narrative/Language Impairment and Anxiety

Intact language and communication skills are fundamental to children's ability to engage in social relationships and access learning experiences (Norbury, 2014). It has been indicated that having a disability with an associated language deficit is socially isolating (Keating & Mirus, 2003; Ochs, Kremer-Sadlik, Solomon, & Sirota 2001; Orsmond, Krauss, & Seltzer, 2004) and social skills deficits are a core feature of ASD, where children have restricted social communicative skills to successfully initiate interactions, uphold conversational turn-taking, and respond appropriately to others (Kamps et al. 2015). These deficits ultimately have a negative affect on communication development and social outcome across the lifetime (Shceern, Koot & Begeer, 2012). Language disorder has also been identified as a potential risk factor for social phobia in late adolescence, where a longitudinal study found that 76 children aged 5 years old with a language impairment were 2.7 times more likely than TD participants to have social phobia by the age of 19 and in adulthood (Voci, Beitchman, Brownlie, & Wilson, 2006; Brownlie, Bao & Beitchman, 2016). Individuals in the language-impaired group were also more likely to have fears of public speaking and even speaking in small groups. As language, by way of sharing personal narratives, has previously been established as an important mode for successful communication, this fear of public speaking is not surprising.

There are two potential causal pathways when looking at the link between language and anxiety. When narration is weak children may be at risk for developing social and behavioral problems due to their limited ability to interact with others (Snow, Burns & Griffin, 1998). In addition to social difficulties, children and youth with a language impairment report higher levels of anxiety and are diagnosed with anxiety disorders more frequently than TD peers (Conti-Ramsden & Botting, 2008; Maggio et al. 2014). Children with ASD have been noted to spend less time socializing and are on the edge of social groups with fewer friends compared to their TD peers (Bauminger, & Shulman, 2003; Kasari et al., 2011; Chamberlain et al., 2007). Furthermore, the few relationships that they do develop tend to be more strained, with a preference towards adult interactions as adults are more understanding of the social difficulties children with ASD are experiencing (Bauminger & Shulman, 2003; Owen-DeSchreyver, Carr, Calse, & Blakely-Smith, 2008). The second causal pathway indicates that limited cognitive abilities, and poor language and narrative skills may result in children being unable to understand and express their own thoughts and feelings, which may lead to increased anxiety (Russell and Safronoff, 2005). Whether one pathway is more prominent than the other, or whether both pathways play a role in the manifestation of anxiety in people with ASD has yet to be established. This points towards the necessity of examining the link between anxiety within the context of narrative language more closely in individuals with ASD as these two areas have a significant bearing on the day-to-day functioning of these individuals.

Part 3 – Anxiety

1.6 ANXIETY

Mental health issues are being identified in children with ASD alongside the disorders' core features that have a profound effect on everyday functioning. Children with ASD are most likely to experience anxiety than the TD population, with 40% meeting the diagnostic criteria for at least one anxiety disorder (Steensel, Bogels, & Perrin, 2011; NICE, 2013), and prevalence rates that are 7-13% higher than that estimated for the TD population (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015; Steensel & Heeman, 2017). The most common comorbid anxiety disorders found within the ASD population include social phobia (50%), specific phobias (30 – 44%), generalised anxiety disorders (15 – 35%), separation anxiety disorder (9 – 38%) and Obsessive Compulsive disorder (17 – 36%) (Steensel, Bogels, & Perrin, 2011; Spain, Sin, Linder, McMahon & Happe, 2018; White, Oswald, Ollendick & Scahill, 2009). The wide range of estimates on the prevalence of anxiety in ASD may be attributed to methodical issues. A report by Spain et al., (2016) suggests that (a) differences in sampling strategies, (b) types of measures used, (c) varied cognitive abilities, and (d) failing to differentiate between co-morbid disorders and ASD could bias the prevalence rates.

It has been documented that high levels of anxiety can negatively affect the lives of children and adolescents as it may lead to higher risks for poor academic performance, depression, fewer social interactions, decreased self-confidence, and increased family conflicts (Barrett & Pahl, 2006; Ameringen, Mancini, & Farvolden, 2003; Velting et al., 2004). If a child were to have a co-occurring anxiety disorder, it may contribute to the social impairment seen in ASD leading to an increase in avoiding social situations, awkward interactions with peers, and further isolation from same-age peers (Myles, Barnhill, Hagiwara, Griswold, & Simpson, 2011). White et al., (2011) describes a cyclic relationship where the core social deficits of ASD cause anxiety leading to further social problems. The inability to construct narratives underlies the core social deficits of autism; this causes the child anxiety, in turn exacerbating communication problems such as the inability to construct narratives. Additionally, the core social deficits of ASD that may include cognitive delays may prevent a child from fully understanding their emotions, their poor language skills may also prevent them from being able to express these emotions to people they interact with, in turn leading to anxiety (Russell and Safronoff, 2005). These deficits can increase susceptibility to social rejection, teasing and bullying (Schroeder, Cappadocia, Bebko & Weiss, 2014), which may then give way to negative thoughts and self-perceptions (Spain, Sin & Freeman, 2016). A recent systematic review looked specifically at whether the core socio-communicative deficits of ASD exacerbate social anxiety. The findings indicate significant relationships between high social anxiety and poor social skills and social competence associated with the quality and quantity of verbal and non-verbal communication and the amount of reciprocity an individual engages in (Spain, Sin, Linder, McMahon & Happe, 2018). The study also suggests that there are no strong links between the core ASD features of restricted and repetitive behaviors as well as sensory aversions and social anxiety (Spain et al. 2018). Based on these collective reports it is plausible to suggest that the above risk factors increase anxiety in people with ASD, which may in turn inflate certain ASD symptoms such as speech and language deficits further leading to social avoidance.

1.6.1 Factors Associated with Anxiety

The communication deficits within autism may not only affect how individuals with ASD interact with their surrounding environment but may also influence how they experience anxiety. For example, in the TD population, social anxiety increases as communication deficits increase (Blood, Blood, Maloney, Meyer, & Qualls, 2007; Davis et al., 2011). Though very little information exists on the relationship between anxiety and communication skills within the ASD population, it has been examined previously with different patterns emerging across the spectrum, primarily for children who are verbal. For children aged 2-14 years and diagnosed with autistic disorder (AD), as communication skills increase, anxiety increases (Davis et al., 2011). With children diagnosed with the previously termed Pervasive Developmental Disorder – Not otherwise specified (PDD-NOS), a decrease in communication skills was met with an increase in anxiety levels (Davis et al., 2011). Another study that looked at 735 infants and toddlers between 15 and 36 months of age with AD and PDD-NOS, found that an increase in receptive and expressive communication skills was associated with increased anxiety levels (Davis et al., 2012). A more recent study that evaluated 159, 4-7 year old's with ASD found that higher structural language (articulation, phonology and syntax) and lower pragmatic language skills positively predicted anxiety, i.e. children with higher structural language abilities and lower pragmatic language skills reported higher levels of anxiety in a 6-month follow-up (Rodas, Eisenhower, & Blacher, 2017). Lower pragmatic language skills also predicted higher externalising behaviors such as bullying, aggression and hyperactivity/inattention. Though not always the case, research has indicated that children with ASD who are more adept at expressing themselves verbally and present with a higher IQ, experience more anxiety than their lower-functioning counterparts (Bellini, 2004; White et al., 2009; Davis et al., 2012). This is further indication that the core deficit of communication skills, affect levels of anxiety experienced in children with autism.

These varied results can be attributed to the different types of assessments used, the sample sizes, and the distinct range of ages each study recruited. Davis and colleagues (2011), recruited a total of 99 participants ranging from 2 to 14 years of age and these were split equally into 3 groups of AD, PDD-NOS, and TD. The second ASD study recruited a total of 735 participants ranging from 15 to 36 months who were unequally split into 3 groups with 107 in the AD group, 110 in the PDD-NOS group and 518 in the atypical development group who have no diagnosis of AD or PDD-NOS but do have preexisting medical conditions (Davis et al., 2012). Furthermore, the measures used were understandably different to reflect the dissimilarity between the ages of recruited participants and the varied populations. For example, due to the young age of the participants in the Davis et al. (2012) study, multiple informants (parents, psychologists, speech language therapists) and multiple assessments were used to confirm a diagnosis of either AD, PDD-NOS, or a developmental delay. In the case of confirming the presence of an anxiety disorder, which is also difficult to determine in such a young age group, a total anxiety score was calculated from the Avoidance Behavior and Anxiety/Repetitive Behaviors subscales of the Baby and Infant Scale for Children with aUtIsmTraits (BISCUIT).

There are multiple ways to explain the conflicted findings beyond varied methodologies. The presentation of low anxiety with increased communication deficits in participants with autism may reflect a decreased ability to be anxious or express it in ways that are recognised (Davis et al., 2011). In the case of the children in the PDD-NOS group, their increased anxiety in relation to poorer communication skills, may be the result of their inability to express their internal states verbally and instead they resort to nonspecific behaviors such as avoidance, disruptive conduct, or tension (Postorino et al., 2017).

Alternatively, there are negative social connotations that come with a diagnosis of autism that individuals may be aware of such as difficulty in maintaining a conversation and using speech that may be considered as odd by others. A better hold on language means children are better at understanding the world around them providing them with more to fixate on and worry about (Davis et al., 2012). This combined with heightened sensory sensitivity and difficulty in regulating emotions (Wood & Gadow, 2010; Scarpa, & Reyes, 2011) could all result in fear of being judged and in turn may increase their anxiety. A recent study lends support to this speculation where children with ASD who are referred to as high functioning and have high structural language scores, reported higher rates of anxiety (Rodas, Eisenhower & Blacher, 2017).

The ways in which mood affects how a person processes information has also been explored. In TD populations, a positive mood and optimistic nature were linked with global processing, whilst trait anxiety and depression were linked to a local processing style (Basso, Scheff, Ris & Dember, 1996). More recent studies indicate similar results where emotion and mood affect perceptual processing (Fredrickson & Branigan, 2005; Srinivansan & Hanif, 2010). Another study found that undergraduate students who scored high on an anxiety test and were presented with a Navon task embedded within games that induced a negative emotional state, showed a local processing bias (Derryberry & Reed, 1998). Another study found that people with depression and trait anxiety had a local processing bias while those with a positive mood and were optimistic had a global processing bias (Basso, Schefft, Ris & Dember, 1996). Within the ASD population, one study examined the moderating effects of anxiety and cognitive functioning on the relationship between weak central coherence and social skills in 102 children with ASD. The results indicate that anxiety and cognitive functioning moderate the association between WCC and social skills in children with ASD (Hill, 2014). On the other hand, another study that examined the association between anxiety and local processing bias in children with ASD did not find an association between anxiety and WCC (Burnette et al. 2005). Though they used 3 different tasks to measure WCC abilities, their lack in finding an association may be due to their use of self-report measures of anxiety, where reliability and validity among children and adolescents remains unclear (Mazefsky, Kao, & Oswald, 2011). Though the current evidence is conflicted, research has shown the co-morbid occurrence of anxiety and mood disorders in people with autism (Ghaziuddin, Weidmen, & Ghaziuddin, 1998; Muris & Steerneman, Merckelbach, Holdrinet, & Meesters, 1998), and there is limited evidence suggesting their higher levels of anxiety may be associated with their preference towards local processing on WCC tasks.

The link between individuals with autism that require low support and anxiety should not detract from the possibility that less able children are simply unable to understand and express the emotions they are experiencing because they do not have the cognitive abilities, self-perception and language skills needed (Russell and Safronoff, 2005). Children may be unable to describe their own symptoms, which is further compounded by the lack of communication that may hinder parents or caregivers from recognising these symptoms. The varied results across the spectrum of ASD may be attributed to more severe cases of ASD exhibiting increased deficits across a majority of functioning skills thereby being less able to express anxiety in a way that people can understand and interpret.

Though these results suggest that anxiety and communication skills are correlated, not enough evidence exists to determine the exact nature of this relationship. The assessments used to assess anxiety in the ASD population have also yielded mixed results, with reports of little correspondence between self-reported and parent-reported measures (Mazefsky et al., 2011), adolescents under-reporting their own anxiety (White et al. 2012); and others finding good agreement between parent and child reports on both anxiety and depression measures (Ozsivadjian, Hollocks, Hibberd, 2013). Also, until recently, the measures used to assess anxiety were created for the TD population and then modified to accommodate the characteristics of individuals with autism (Rodgers et al., 2016). This was done by using empirically based evidence of anxiety phenomenology in ASD which includes adding items related to sensory anxiety, intolerance of uncertainty, and phobias (Rodgers et al., 2016). These varied findings are most likely due to the different assessments that have been examined indicating some tests are more adept at identifying anxiety in the ASD population than others. Furthermore, the developmental changes a person with ASD goes through from infancy to adolescence to adulthood is not taken into account, as research has found that anxiety levels fluctuate across the lifespan (Davis, et al., 2010).

1.6.2 Treating Anxiety in Autism

Psychological treatment and psychopharmacological drugs are two main types of treatments that have been shown to effectively treat the three anxiety disorders of panic disorder, generalised anxiety disorder and social anxiety disorder (NICE, 2011; Baldwin et al., 2014). Psychological therapy includes but is not limited to, relaxation, interpersonal therapy, eye movement desensitization reprocessing and mindfulness meditation, with cognitive behavioral therapy (CBT) being the most studied method (Bandelow et al., 2015; Chalfant, Rapee, & Carroll, 2007). In one recent meta-analysis that compared the treatment effects of psychotherapy to drug therapy within the TD population, it was found that psychopharmacological drugs used for anxiety disorders have significantly higher effect sizes than psychological therapies with desired results achieved in quicker time frames (Bandelow et al., 2015). However, it is recommended to try psychological interventions prior to resorting to pharmaceuticals (NICE, 2013).

The effectiveness of CBT for anxiety and specific phobias in the ASD population offer empirical data on positive treatment outcomes (King, Heyne, & Ollendick, 2005; Ung, Small, Selles, & Storch; 2014; Chalfant, Rapee, & Carroll, 2006). CBT targets cognitive and behavioral factors that contribute to the maintenance of anxiety symptoms (McKay & Storch, 2009). Behaviorally, the individual is exposed to a stimulus that they fear and usually avoid in a steady, consistent manner allowing them to naturally familiarize to the feared stimuli. Cognitively, the individual is encouraged to identify emotions, contest previously learned assumptions, and cognitively target negative thoughts by changing they way they are cognitively viewed (Bandelow et al., 2015). Effective modifications of CBT for autism include social stories that explain the thoughts and feelings of others, social coaching to develop social skills as well as visual aids to enhance CBT factors (Wood, & Drahota, 2005; Wood, Drahota, Sze, Har, Chiu, & Langer, 2009).

1.6.3 Narratives to Reduce Anxiety

Constructing narratives is thought to supplement how individuals understand and describe to themselves and others their experience of anxiety and has also been implemented in psychological approaches to treating anxiety (Cashin, 2008). Yet, no research exists on improving narrative production skills with the intent of reducing anxiety. There is research that shows the use of narratives as a therapeutic tool in reducing anxiety within the TD population (Rahmani & Moheb, 2010; Looyeh, Kamali, Ghasemi, & Tonawanik, 2014) as well as within the ASD population (Cashin, Browne, Bradbury, & Mulder, 2012). However, the methods these studies used relied on children exploring their anxieties through telling stories, readings and discussions to increase awareness of their own feelings and emotions. These findings highlight the need for further research into the possible link between narrative production skills, anxiety and ASD.

1.7 THE CURRENT THESIS

It is clear from the evidence presented so far that children with autism have deficits in communication skills that includes narrative language. Narrative skills are required for a person to share events that they have experienced with others, allowing them to establish relationships within social settings. The failure of these social interactions has an impact on negative self-perception for these individuals, which may result in avoidance behaviors and anxiety. Therefore, young children with language impairments have a higher risk for developing mental health problems later in life that includes anxiety. Despite knowing that children with autism have higher rates of anxiety than the general population, there is little research that links the problems with language to anxiety, and none that focus on narratives. Therefore, the primary aim of this thesis is to investigate the nature of the relationship between narrative language and anxiety in children with autism. Establishing the nature of this relationship in the ASD population can support the creation of effective treatment programmes and further the current understanding of social and cognitive theories within autism.

The first aim of this thesis is to examine the narrative language of children with ASD and compare them to their TD peers. The second aim is to explore the possible link between the two variables of narratives and anxiety within the ASD population as these deficits have been observed in children with ASD. Another significant route of investigation is the use of narrative skills treatment to improve anxiety within children with ASD who require low support. These results will aide clinicians in providing holistic and optimal services to children with ASD that is evidence-based.

1.7.1 Research Questions

1. How do the narratives of children with ASD differ from those of their typically developing peers?
2. Does narrative ability predict anxiety in ASD and TD children, when language and nonverbal IQ are controlled?
3. Does narrative intervention lead to improved narrative skills and social cognitive performance, and would this lead to a subsequent reduction in symptoms of anxiety?

CHAPTER 2

EXPLORING HOW THE NARRATIVES OF CHILDREN WITH ASD DIFFER FROM TYPICALLY DEVELOPING PEERS: A CONFIRMATORY ANALYSIS

2. INTRODUCTION

To establish what type of relationship exists between narrative production and anxiety in individuals with ASD, a thorough analysis of narrative production must first be undertaken to determine which narrative measures children with ASD struggle with the most compared to their TD peers. This will be followed by a correlation and regression analysis to determine whether a relationship exists between narrative measures and anxiety and whether narrative measures predict anxiety. A narrative intervention targeting personal narratives to improve social cognitive skills and reduce anxiety will then be conducted. The aim of this chapter is to closely compare the narratives of children with autism to their TD peers by looking at story grammar components, sentence productivity, syntactic complexity, referential cohesion and evaluative devices.

2.1 NARRATIVES IN RESEARCH

To maintain successful social interactions, people must be able to deliver a contextually rich narrative to their peers drawing from a scope of linguistic, social and cognitive skills (Norbury & Bishop, 2003). Narratives can be viewed as a combination of elements of microstructure and macrostructure. Microstructure refers to complexity and productivity, measured at the sentence level, while macrostructure goes beyond the sentence level, examining the total coherence and organisation of the narrative (Heilmann, Miller, Nockerts, & Dunaway, 2013). To produce an efficacious narrative, linguistic elements are needed to connect sentences and to express relations between them, semantic skills are needed to use varied vocabulary to better express meaning, and syntactical skills are required to form sentence level expressions. Furthermore, the ability to monitor and maintain the listeners involvement, while considering the thoughts, emotions, and actions of themselves and other people plays an important role (Ochs & Capps, 2001). The struggle that any child with a language disorder faces in producing narratives inhibits their ability to connect their experiences in meaningful ways, thereby limiting their chances of developing significant relationships with their peers (Losh & Capps, 2003).

There is great variety in the linguistic abilities of people with ASD, (Condouris, Meyer, & Tager-Flusberg, 2003) including those who show intact linguistic skills (Loucas et al, 2008). However, research has shown that people with ASD are less likely than their typically developing (TD) peers to use emphatic stress, repetition, character speech, sound effects, complex syntax, causal connections, and chronological sequencing in their narratives (Capps, Losh, & Thurber, 2000; Diehl, Bennetto, & Young, 2006; McCabe, Hillier, & Shapiro, 2013). Their narratives are also sparse in terms of internal state terms as they are less likely to include terms that refer to cognitive and affective states (e.g., know, confused, laughed, happy), and are also less likely to account for the causes of the characters mental states (Rumpf, Kamp-Becker, Becker, & Kauschke, 2012; Brown, Morris, Nida, & Baker-Ward, 2012; Capps et al., 2000; Losh & Capps, 2003; Tager-Flusberg, & Sullivan, 1995; Baron-Cohen et al., 1986; Happe, 1994).

Due to the formation of narratives through connected language, and their integration of linguistic and pragmatic elements, narratives provide a rich context for assessment (Botting, 2002; Heilmann, Miller, Nockerts, & Dunaway, 2013)). They are also helpful clinically, where normative data is unavailable or where children are difficult to assess using standardised measures due to a lack of sensitivity or inability to detect small changes over periods of time (Bishop & Adams, 1989). To effectively analyse and understand the narratives of children with autism, the narrative skills of typically developing children provide a valuable benchmark of developmental comparison (Botting, 2002). Researchers have used multiple ways to analyse narratives over the past two decades, the most common of which are described below.

2.2 NARRATIVE SKILLS IN ASD

2.2.1 Story Grammar

Story grammar is the inclusive organization of the main story elements and explores the development of the storyline. Research often uses story grammar elements that are modeled after the story schema outlined by Stein and Glenn (1979), as their approach aligns well with oral and written narrative expectations. Though elements have evolved from the original Stein and Glenn schema, they are conceptually the same and include Character, Setting, Problem (initiating event), Plan/Attempt, Consequence, Ending (resolution), Emotion (Internal Response), and sequence (Petersen & Spencer, 2016). These story grammar elements are causally linked together to provide a coherent narrative (Table 2.1). Typically, around 3 years of age, less than 20% of TD children are able to provide any of these components in their narratives. Around 5 years, most children can provide an initiating event, 50% provide an explicit goal and 20% provide a suitable outcome. By the time children are 9 years old, they are able to include these elements successfully into their narratives, though still not as efficiently as adults, (Karmiloff-Smith, 1985).

Table 2.1

Elements of Story Grammar

Character	Includes details of who the main and secondary characters are
Setting	Includes three elements of time, activity and location of the narrative
Problem (Initiating Event)	Usually a problem that the main character encounters that needs to be solved
Plan/Attempt	The possible solution to the problem, which is a result of how the main character feels about said problem and the efforts taken to achieve this goal.
Consequence	A direct result of the plans/attempts in the narrative
Ending	The resolution of the story
Emotion (Internal Response)	The thoughts, wishes, or emotions of the main character regarding the problem
Sequence	The thoughts, wishes, or emotions of the main character regarding the problem

Previous research on the use of story grammar elements has found that children with ASD relate a number of these elements that is similar to the TD population in their narratives (Young et al., 2005: Norbury et al., 2013; Norbury & Bishop, 2003), whilst others have found that the number of core story grammar elements children and adolescents with ASD produce are significantly less than their TD peers (Goldman, 2008; Makinen et al., 2014; King, Dockrell & Stuart, 2014). This is most likely due to different strategies of data collection and overall methodology.

2.2.2 Deviation

Narratives of children with ASD have also been distinguishable from TD children based on the inclusion of more bizarre or irrelevant information to their narratives (Diehl, Bennetto, & Young, 2006; Norbury, Gemmell & Paul, 2013). Referred to as a discourse feature (Makinen et al. 2014) these details that are extraneous to the storyline are more often used by children with ASD, yet this is not the case with the entire ASD population when generating a narrative from a picture-book (Norbury & Bishop, 2003).

2.2.3 Syntactic Complexity and Narrative Productivity

The more detailed linguistic structure within narratives are analysed by looking at syntactic complexity and sentence productivity. Sentence productivity can be measured by total number of words, clauses or communication units (C-units). A C-unit is an independent utterance with its modifiers that cannot be further divided without losing its' fundamental meaning (Miller, Andriacchi, & Nockerts, 2015). When compared against their TD peers, children with ASD have been shown to perform similarly on sentence productivity and syntactic complexity (Novogrodsky, 2013; Losh & Capps, 2003; Norbury & Bishop, 2003; Young, Diehl, Morris, Hyman, & Bennetto, 2005; Rumpf et al., 2012). Other studies indicate that children with ASD produce shorter narratives, use fewer words, and simpler syntax (Norbury, Gemmel, & Paul, 2013; Rumpf, Kamp-Becker, Becker, & Kauschke, 2012; Norbury & Bishop, 2003). Despite these differences, there is a general consensus in the field, that the poor narrative skills in children with ASD may be due to their poor language, particularly their syntactic skills (Peristeri, Andreou, & Tsimpli, 2017). Furthermore, age is thought to account for 34% of variance seen in narrative performance, where narrative competence increases as a child gets older (Norbury et al., 2013).

2.2.4 Narrative Cohesion

Cohesion refers to the way in which a speaker links the local narrative structure by primarily using referencing strategies to refer to characters. The narrator has to accurately introduce different characters through multiple events that commonly occur in a single narrative while simultaneously considering the listener's needs and what information is new and what has been provided previously (Baltaxe & D'Angiola, 1992). The use of referencing becomes more sophisticated as linguistic abilities develop with age and increasingly complex stories are produced. Within the TD population, children around 4 years of age construct narratives that are difficult to follow, as they do not use a clear referencing strategy, relying heavily on pronouns without delineating whom the pronoun refers to, resulting in an ambiguous scheme (Wigglesworth, 1997). Children with HFA have been found to use significantly more ambiguous references in their narratives than their peers rendering their stories as less cohesive (Norbury & Bishop, 2003; Norbury et al., 2013). Conflicting results also exist, where no significant differences have been observed between children with ASD and their TD peers in the use of referential accuracy (Makinen et al., 2014). The method in which the narrative was elicited may also influence the type of references used; children with ASD use more ambiguous pronouns than their TD peers in narrative generation tasks than narrative retell tasks (Novogrodsky, 2013).

2.2.5 Evaluative Devices

Evaluative comments can be used to explain the causes and consequences of the main events in a narrative. They allow the narrator to aid the listeners understanding of events by evaluating the facts of the narrative. To effectively use these higher-order skills, an understanding of social interactions is needed, such as frames of mind, character speech, hedges, negative comments, emphatic remarks, and causal connectives (Bamberg & Damrad-Frye, 1991).

To date, research has diverged in regard to the similarities and differences between HFA children and TD peers on the number of evaluative comments used. Some evidence points towards ASD children using fewer mental state terms than their TD peers (Rumpf, Kamp-Becker, Becker, & Kauschcke, 2012) while others have found no differences (Tager-Flusberg, 1995; Capps, Losh, & Thurber, 2000; Norbury & Bishop, 2003). King, Dockrell, and Stuart (2013) found significant differences between ASD children and chronological-age matched peers where the former group had fewer references to mental state terms, use of causal statements, and the overall number of evaluative devices. Unlike previous papers that explored evaluative devices, language was controlled for in this study, and the performance of the ASD group was found to be comparable to younger TD peers; i.e., fewer differences were found between these two groups. This indicates that language proficiency plays a significant role in how well a narrative is told. It also highlights the importance of conducting experiments at different age levels to provide clear evidence of a developmental pattern. The children who participated in King, et al.'s (2013) study were slightly older than those recruited in other papers and so may have had better mastery at the use of evaluative markers as it is a skill that develops with age (Bamberg & Damrad-Frye, 1991; Norbury & Bishop, 2003).

2.3 THE CURRENT STUDY

The results that have been published to date on the narrative performance of children with autism are varied. This inconsistency in describing narrative language is most likely due to several factors; elicitation methods that vary with each study, the varied cognitive skills of participants, language disorders, as well as a wide age range that may deliver varied linguistic skills. Though the literature on narrative abilities of children with ASD is wide, it is not extensive. Understanding the strengths and limitations of narrative abilities of children with ASD is a clinical requirement to provide better assessment protocols and tailored intervention programmes for children who present with a core language problem.

The narrative abilities of Kuwaiti, English-speaking children with HFA and their TD peers will be compared, while controlling for language, age and nonverbal IQ. The retell and generation narratives collected will be coded for structural, linguistic and pragmatic measures to provide a detailed account of performance. This will include the total number of words (TNW), the number of communication units (C-Units) per narrative, the mean length of C-Units (MLCU), lexical variety as measured by type token ration (TTR), number of mazes, referential accuracy, evaluation devices and story grammar.

The first question explored here is how the narratives of children with ASD differ from those of their TD peers. It is hypothesized that there will be differences on microstructural, macrostructural and frame of mind measures with the group with ASD performing at a lower level to their TD counterparts.

2.4 STUDY DESIGN AND METHODOLOGICAL DECISION MAKING

2.4.1 Testing in English

As the best schools that provide special needs services in Kuwait are private American, English or Bilingual schools, children with autism are exposed to English as much as Arabic and in some cases parents encourage the use of English only at home as a way to support their academic performance at school. Having a diagnosis of autism in Kuwait generally means the opportunity to continue for a university degree within the country is highly diminished. Therefore, the only option left for parents would be to send their child abroad for a higher degree whereby proficiency in the English language would be more beneficial. For this reason, all the assessments used were in the English language.

In addition to this, there are no standardised language tests to date for the population that speaks the colloquial Kuwaiti-Arabic. There are various forms of Arabic that people are exposed to on a daily basis. There is Classic Arabic found primarily in the Qura'an, Modern Standard Arabic that is used in classrooms in either printed or spoken form. These two forms of Arabic are used across the Arab world and serve as a common ground of communication between people of different Arab nationalities. Finally, there exists the colloquial spoken Arabic that people use in their daily interactions with each other and is unique to each Arab country. Though language tests do exist for speakers of colloquial Jordanian-Arabic and Saudi Arabian-Arabic, there is a difference in nouns, verbs and pronunciations that would not allow an accurate lingual representation of the Kuwaiti population. This also applies to norm-referencing tests be they in Arabic or English. As these scores are determined by comparing scores against the performance results of a statistically selected group of test takers of the same age or grade level, they could not be used, as they do not reflect the hypothetical average student who speaks Kuwaiti Arabic, nor the Kuwaiti student who speaks English.

2.4.2 Type of Narrative

The primary aim of this study is to compare between the ASD and TD population on narrative measures of macrostructure, microstructure and evaluative devices. The data gathered involved eliciting narratives using two forms of procedures, retell and generation, that resulted in two separate narrative scores and different statistical results, each with it's own unique explanation.

The main question being asked does not involve exploring how narrative abilities differ based on elicitation procedure. As is such, it is beyond the scope of the current paper to provide a comprehensive discussion concerning the disadvantages and advantages of varied elicitation procedures on narrative performance. Furthermore, prior studies have focused only on one type of elicitation procedure when comparing narrative skills between different populations, the majority of which fall under the broad category of either story retells or generations (Baixauli, Colomer, Rosello, & Miranda, 2016). This allows the researcher to provide a more detailed and thorough account of the results with better opportunities in explaining their significance.
Though retell tasks produce narratives that are generally longer, contain more story components, and are easier to score (Merritt & Liles, 1989), it has been highlighted that the majority of studies exploring narratives of children with high-functioning autism spectrum disorder, have used either personal or fictional generations with a wordless picture book from the Mayer series of frog stories or the story 'Tuesday" from the ADOS kit (Baixauli, Colomer, Rosello, & Miranda, 2016).

Though removing the analysis and results of the retell task would mean losing the prospect of presenting data on an angle that is not commonly explored, it will allow for a more detailed comparison of the findings of this study to a large existing pool of international data on generation tasks. All pertinent information related to the retell task will be found in Appendix B.

2.4.3 Recruitment

To be able to access students with ASD within the schools, a letter directed to the Ministry of Education was sent from the department of Communication Science and Languages at Kuwait University detailing the study including the population targeted and the tests to be used. Once the materials to be used were viewed and permission given to proceed, private clinics as well as schools with an inclusion programme and special needs units were selected and approached.

All 20 participants from the TD group were recruited by word of mouth. A total of 5 schools and 1 private clinic were contacted to gather data for the ASD group. 4 children were recruited from a private counseling clinic, 5 from a private, Arabic-English bilingual school with an inclusion programme for high-functioning students with ASD, and 10 from three private English special needs schools. The psychologist within each school helped to identify the potential participants based on the inclusion criteria detailed in the next section.

Prior to the data collection for the main thesis, a pilot was conducted to determine the feasibility of this study. During this time, recruitment was a difficult and slow process. Parents required a stronger personal incentive to have their children participate in the study. While recruiting for the main correlation study it was agreed that on the conclusion of the study, parents of children with ASD would be provided with a summary report of results of the tests applied while stipulating that said report was to not be used in any official capacity as a way to diagnose the participating children. This encouraged more parents to allow their children to join the study, thereby speeding up the recruitment process. A sample report can be found in Appendix C. Though parents of TD children were offered a similar report of test performance, none required it as a condition of participation.

2.4.4 Inclusion Criteria

The participants in both groups met the following inclusion criteria: children are fluent bilinguals of the English and Arabic languages (as measured by a bilingual questionnaire and based on school performance according to teachers); children have no hearing, speech-language and/or learning difficulties confirmed by both parents and the school psychologist based on each childs' history; and are enrolled in mainstream schools. Inclusion criteria that pertain to the ASD group in particular required them to be of low support (Level 1, see Appendix A) with no accompanying intellectual impairment and have been selected for their abilities to read, write, speak and manage life skills without much assistance.

Diagnosis of Autism in Kuwait

In Kuwait, schools are required by law to only accept a medical diagnosis that originates from government-employed psychologists. This causes some confusion as parents usually provide schools with two sets of diagnoses, one from the government and one from the private sector. More often than not, there are conflicting opinions from the two divisions. Despite this, children who were registered by the school as having ASD were still included if they also met the above criteria. Also, the Autism Diagnostic Observation Schedule (ADOS-2) (Lord, Rutter, DiLavore, & Rissi, 2008) was administered to the ASD group as a confirmation of diagnosis and severity.

The initial age range was placed at 9 – 14 years old as previous research with TD children has shown that full narrative abilities are developed by 9 years of age (Karmiloff-Smith, 1985). However, as children within this population of high-functioning ASD were hard to access and recruit, and in a country like Kuwait, where parents are not familiar with the proceedings of research, difficulty in reaching these children was compounded. Therefore, the age range was expanded to between 8 and 15 years old enabling a larger group of children to participate, a greater pool of data to analyse, thereby increasing the power of the study.

2.4.5 Participants

A total of 39 children aged 8 – 15 years participated in this research, 19 children with autism spectrum disorder ranging in age from 8 years to 15.9 years old, (ASD, M = 11.2 years SD = 2.8) and 20 typically developing children ranging in age from 7.4 years to 15.1 years old, (TD, M = 11.8 SD = 2.1). Four of the 39 participants were female, two within each group. At the time of data collection, all participants were enrolled in bilingual, American or British private schools where the main language of teaching is English except for the bilingual schools where the teaching language alternates between Arabic and English. For more details on the participant characteristics, please refer to Table 5 in the results section.

2.4.6 Ethics

Prior to recruitment, the research was reviewed by the Research Ethics Committee in the University of Reading and was granted permission to proceed (2016-001-TL). Parents of the ASD group were first informed of the study over a phone call conducted by the school's psychologist. Those who gave verbal consent were then sent an information sheet (Appendix D) with greater detail of the research as well as a consent form (Appendix E) for them to sign and the bilingual questionnaire to send back to school with their children. All forms were sent in English. After parental permission was given, children were given simplified versions of the information sheet (Appendix F) and consent form (Appendix G) to sign.

2.5 MEASURES

The following section details all the assessments used in this particular study. The Spence Children's Anxiety Scale – Parent version (SCAS-P) (Spence, 1998) (Appendix H), was administered at the same time that language, vocabulary, non-verbal IQ tests and narrative stories were administered. However, as it is has no bearing on the narrative study this chapter covers, the measurement itself will be covered in Chapter 3, section 3.3.

2.5.1 Assessing Language

Clinical Evaluation of Language Fundamentals - 4

Two assessments were used to evaluate the structural and semantic language skills of participants in both groups. The first is the Clinical Evaluation of Language Fundamentals, 4th Edition (CELF-4) (Semel, Wiig, & Secord, 2003) that assesses receptive and expressive language, including language structure and content. It takes around 30-60 minutes to be administered and was designed to identify individuals aged from 6 to 21 years who are deficient in mature language use. Of the six sections in CELF-4, only the core language score and indexes was used which provides a measure of general receptive and expressive language ability. The subtests of the core language score and indexes are: concepts and following directions; recalling sentences; formulated sentences; word class-total, and word definitions. These subtests assess areas of syntax, morphology, and semantics within language. The lowest possible score is 40 and the highest obtainable score is 160. The Core Language Score has a mean of 100 and a standard deviation of 15. A score of 100 represents performance of the typical student of a given age. As the CELF-4 is not normed on the population sample that has been recruited for this study, the raw scores from the core language score and indexes will be used in the analyses.

For test-retest reliability and based on a standardised population, the stability coefficients range from .71 to .86 for subtests and from .88 to .92 for composite scores. For subtests requiring clinical judgments and interpretation of scoring rules, inter-scorer agreement ranges from .88 to .99 (Semel, Wiig, and Secord, 2006). There are no norms available for the Kuwaiti population.

2.5.2 Assessing Nonverbal Intelligence Quotient (NVIQ)

Raven's Standard Progressive Matrices

The Raven's Standard Progressive Matrices (SPM) (Raven, Raven, & Court, 2003) is a non-verbal multiple-choice measure of IQ consisting of 60 items presented in 5 domains with 12 items per domain and takes 20-30 minutes to be completed. Each image has a missing piece and below the image are either six or eight options to choose from that complete the image, only one of which is correct. The participants are asked by the examiner to identify the missing component in the figural patterns presented in increasing order of difficulty.

Kuwaiti norms are reported within a Kuwaiti sample of school children, the test-retest coefficient ranged from .69 to .85 while internal consistency values ranged from .88 to .93 (Abdel-Khalek and Raven, 2005). These reported Kuwaiti norms are the same ones used to interpret the performance of the participants in this thesis. The SPM is considered to be the best measure of Spearman's g with the majority of validity coefficients in the .70's and .80's. (Raven, Raven, and Court, 2000).

2.5.3 Assessing Bilingualism

The purpose of this one-page bilingual questionnaire (Appendix I) was to confirm the amount of exposure and use of the languages on a daily basis in the participants' lives, underpinning why the research was conducted in English and not Arabic. It is adapted from a second-language case history form developed by a PhD researcher under the supervision of Professor Theo Marinis at the University of Reading.

The questionnaire consists of 4 sections the first one asking what languages the child speaks and the second asking which language parents believe their child feels most comfortable using. The third section provides a table with a 5-point likert response scale ranging from 0 = never, 1 = rarely, 2 = sometimes, 3 = usually, 4 = always, and asks parents to mention to what degree their child is exposed to the Arabic and English languages. The final section asks to clarify the contexts in which the above-mentioned exposure takes place with parents choosing between mother, father, grandparents, babysitter/child minder, siblings, and school for both languages used. Parents could select one or both languages for each family member/child minder. An option of 'other' languages was provided for children who were multilingual, but this was not used by any of the participants in both groups. The scores were tallied and a final percentage was calculated and included to represent the participants proficiency in both languages.

2.5.4 Assessing Autism

Autism Spectrum Quotient - Child

Parents completed the child version of the Autism Spectrum Quotient (AQ-C) (Auyeung, Baron-Cohen, Wheelwright, & Allison, 2008) (Appendix J). The tool was used to screen for ASD in both groups and used as an independent variable in the analyses. The AQ-C is a 50-item parent reported questionnaire with a 4-point likert response scale developed to detect autistic traits in children between 4 to 11 years of age. Parents rate their child's behavior by relatively agreeing or disagreeing with the items with the following answers to choose from: definitely agree = 0; slightly agree = 1; slightly disagree = 2; definitely disagree = 3, yielding a maximum possible score of 150 indicating full agreement on all autistic items, a cut-off score of 76, and a minimum possible score of 0 indicating no autistic traits (Auyeung, Baron-Cohen, Wheelwright, and Allison, 2008). Total AQ scores are calculated by the sum of each item score. The 50 items of the AQ-C are split into five domains represented by ten items associated with autism spectrum disorder: social skills, communication skills; imagination; attention to detail; and attention switching. Some items were reverse scored to account for any bias in the responses, i.e., the numerical scoring scale runs in the opposite direction to what is mentioned above. The AQ-C has high overall internal consistency at 0.97 with the subtests ranging from 0.88 to 0.92 and good test-retest reliability at 0.85 (Auyeung et al. 2008).

Autism Diagnostic Observation Schedule - 2

The ADOS-2 is a standardised series of structured and semi-structured tasks that assesses social interaction, communication, and the creative use of materials for individuals believed to have autism. It has 4 modules that match the verbal ability of the individual being tested and takes around 30-60 minutes to administer. The ASD group in this study had module 3 administered as it is for children and adolescents who are verbally fluent. This assessment was not carried out on the children in the TD group.

During the assessment, observations are made by the examiner on the participants behavior which are then assigned to preset behavioral classifications. The following 14 items denote the observation/coding subtests in module 3 in which the participant is evaluated on: construction task; make-believe play; joint interactive play; demonstration task; description of a picture; telling a story from a book; cartoons; conversation and reporting; emotions; social difficulties and annoyance; break; friends, relationships and marriage; loneliness; and creating a story. An overall quantitative score is calculated once all behavioral classifications have been scored using a predetermined algorithm that combines points of social affect (communication skills and reciprocal social interaction) and restricted and repetitive behavior. Predetermined cutoffs provide the final classification of classic autistic disorder (total score is 9 or higher), related autism spectrum disorders (total score is 7 or 8) and non-spectrum (total is 6 or lower). Excellent stability is indicated for test-retest reliability within the 'social interaction' and 'communication' domains as well as the combined total. Good stability was found for the ‘stereotyped behaviors and restricted interests’ over a period of 9 months (Lord et al., 2000). The ADOS is highly effective in distinguishing individuals with autism from those with non-spectrum disorders, while also differentiating between autism and ASD with specificities of .68 to .79 (Lord, Rutter, DiLavore, and Risi, 2008).

2.6 NARRATIVE MEASURES

2.6.1 Materials used

Three books were used to elicit narratives. All three books are part of the wordless picture book frog series by Mercer Meyer, Frog Goes to Dinner (FGTD; Mayer, 1974), Frog On His Own (FOHO; Mayer, 1973), and Frog, Where Are You? (FWAY; Mayer, 1969). The stories these books relate provide numerous opportunities for participants to describe the emotional and cognitive states of the characters and have been used repeatedly in narrative assessments and interventions for children with autism and language disorder (Tager-Flusberg & Sullivan 1998; Siller, Swanson, Serlin, & Teachworth, 2014; McCabe, Bliss, Barra, & Bennett, 2008; Colle, Baron-Cohen, Wheelwright, & Van der Lely, 2008). The first two books were used to assess retelling skills whilst the third one was used to assess generation skills. Of the two books used for story retelling, the first one was to allow the child to practice what was being measured i.e. only the second and third stories were transcribed and coded for analysis.

2.6.2 Elicitation Procedures

To ensure that each child is told the same story in the retell tasks, the elicitation aids (Appendix K) for the first two books (FGTD and FOHO) were downloaded from the Systematic Analysis of

Language Transcripts (SALT) (Miller & Iglesias, 2012), an online software that provides materials to elicit, transcribe and analyse language samples. The first book, FGTD, was introduced in the following manner: "Today we will be looking at some picture books. This is the first one and is called Frog Goes to Dinner. I will tell the story first. When I am done, it will be your turn to tell the story." The researcher then proceeded to tell the first practice story. Once finished, the child was prompted to tell the story with the following instructions "Now it's your turn to tell the same story using your own words".

After the child finishes the retelling of FGTD, the second story, FOHO, is introduced in this manner: "This is the second book we will look at today. It is called Frog On His Own. Again, I will tell it first, and when I am done it will be your turn to tell the story". Once finished, the child was prompted to retell the story with the following instructions "Now it's your turn to tell the same story using your own words".

The final book, FWAY, was introduced in the following manner: "This is the last book we will tell today. But this time, I will not tell the story first, you will tell it on your own. Look at all the pictures in the book first and when you are ready, tell me the story". During the narration of each story the researcher only interrupted to ask for clarification in times when the child's voice dwindled or was unclear. Narratives were audio-recorded and transcribed by the researcher. To ensure transcription and coding reliability, 10% of the narratives were checked for accuracy by a licensed speech and language therapist who achieved a high inter-rater agreement of 97.9% for transcription and 92.8% for coding.

2.7 NARRATIVE CODING SYSTEM

Narratives were coded for elements of macrostructure, microstructure and evaluative devices. Only sentences pertaining to the narrative being told for each book were coded, i.e., in the case where the child would pause to ask how many pages are left or asks about the name of an animal, these utterances were not coded.

2.7.1 Macrostructural Measures

For story grammar, the narratives were scored using the flow chart (Figures 2.1 and 2.2, reprinted with permission) of Narrative Language Measures (NLM) from CUBED, a criterion-referenced universal screening and progress monitoring assessment of decoding and language (Peterson & Spencer, 2016). The NLM flow chart is a detailed and sensitive measure of subtle changes in children's narratives where numerical scores are allocated to items that have been carefully selected to reflect narration. These items measure the extent to which oral stories are comprised of story grammar elements, language and episodic complexity and are explained in a detailed way to ensure a systematic scoring system for each child, hence a reliable one (Peterson & Spencer, 2016). The NLM comprises of two measures, the NLM Listening, and the NLM Reading. Additional sections that assess expressive oral language through story generation were used to code the narratives collected in this study. The NLM flow chart codes 4 areas of narrative retell and generation: story grammar, language complexity, episode complexity and writing which is optional. As assessing the writing of participants is not a variable that is of interest to this study, it was not used. The following section details how each of the three sections were scored using the NLM flow chart. The total possible score for all three sections combined is 52. It is expected that around the age of 6 children's personal narratives are coherent (Peterson &

McCabe, 1983), however, narrative complexity may continue to develop into adolescence and adulthood (Bishop, 2004; Berman & Slobin, 1994); i.e., younger participants are expected to produce narratives that are shorter, simpler, with poorer character reference production, and less linguistic complexity (Berman & Slobin, 1994; Novogrodsky, 2013) as certain markers of language, such as the ability to produce clear character references is expected around the age of 11 years (Berman, 2009). As the age of the participants in this study ranges from 8 to 14 years, it is anticipated that the younger participants will score lower than the older ones. Table 2.2 provides a summary of all coded macrostructure elements.

Table 2.2

Summary of Coded Macrostructure Measures

Narrative Measure	Element	Score
Story Grammar	Character	0 – 3
	Setting	0 – 3
	Problem/Initiating Event	0 – 4
	Plan/Attempt	0 – 4
	Consequence	0 – 4
	Ending	0 – 2
	Emotion	0 – 3
	Sequence	0 or 3
	Total possible score	**26**
Episode Complexity	Story grammar elements	2 – 9
	Total possible score	**9**
Language Complexity	Prepositions	1 – 3
	Verb/Noun Modifiers	1 – 3
	Vocabulary/Rhetoric	1 – 3
	Temporal Ties	1 – 3
	Causal Ties	1 – 3
	Dialogue	1 – 2
	Total possible score	**17**

Story Grammar

The story grammar (SG) coding and scoring system reflects the story rubric developed by Stein and Glenn (1979) and is often used in research (Spencer and Slocum, 2010; Spencer, Kaijian, Petersen, and Bilyk, 2014). The NLM flowchart includes the following eight SG elements: Character, Setting, Problem (Initiating Event), Plan/Attempt, Consequence, Ending (Resolution), Emotion (Internal Response), and Sequence. Episode complexity is included in the final SG score and has a separate scoring system based on the combination of two or more SG elements: Problem, Plan/Attempt, Consequence or Ending. All the SG elements can be scored from 0 – 3. In the case where a participant identifies more than one problem and provides a corresponding plan/attempt and consequence, then one extra point is awarded for each of these three elements for a maximum score of 4. The total possible SG score is 35.

Character

The Stein and Glenn (1979) story schema includes character as an element of setting. However, in the NLM it is scored separately to allow for greater sensitivity and to account for important narrative features of reference cohesion (Petersen & Spencer, 2016). For a fictional generation, a child is awarded 3 points if they mention two or more proper nouns such as ‘Adam and David. A score of 2 points is awarded with the mention of 1 proper noun, e.g. ‘Adam. A general noun such as ‘boy’ scores only 1 point. In the case where ambiguous pronouns are used, such as ‘he, she, it’, then the score is 0.

Figure 2.1: NLM Flow Chart – Writing and Language Complexity

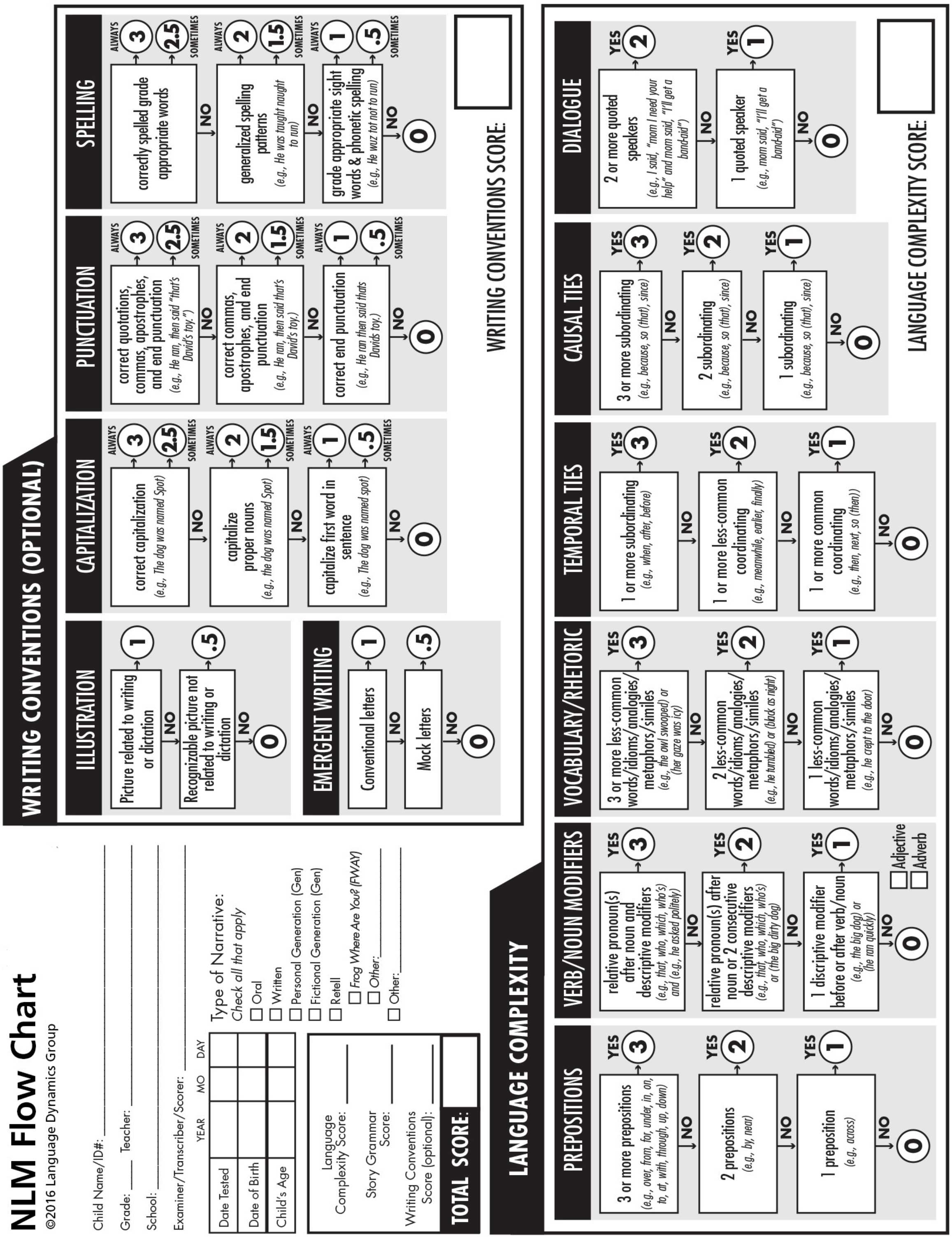
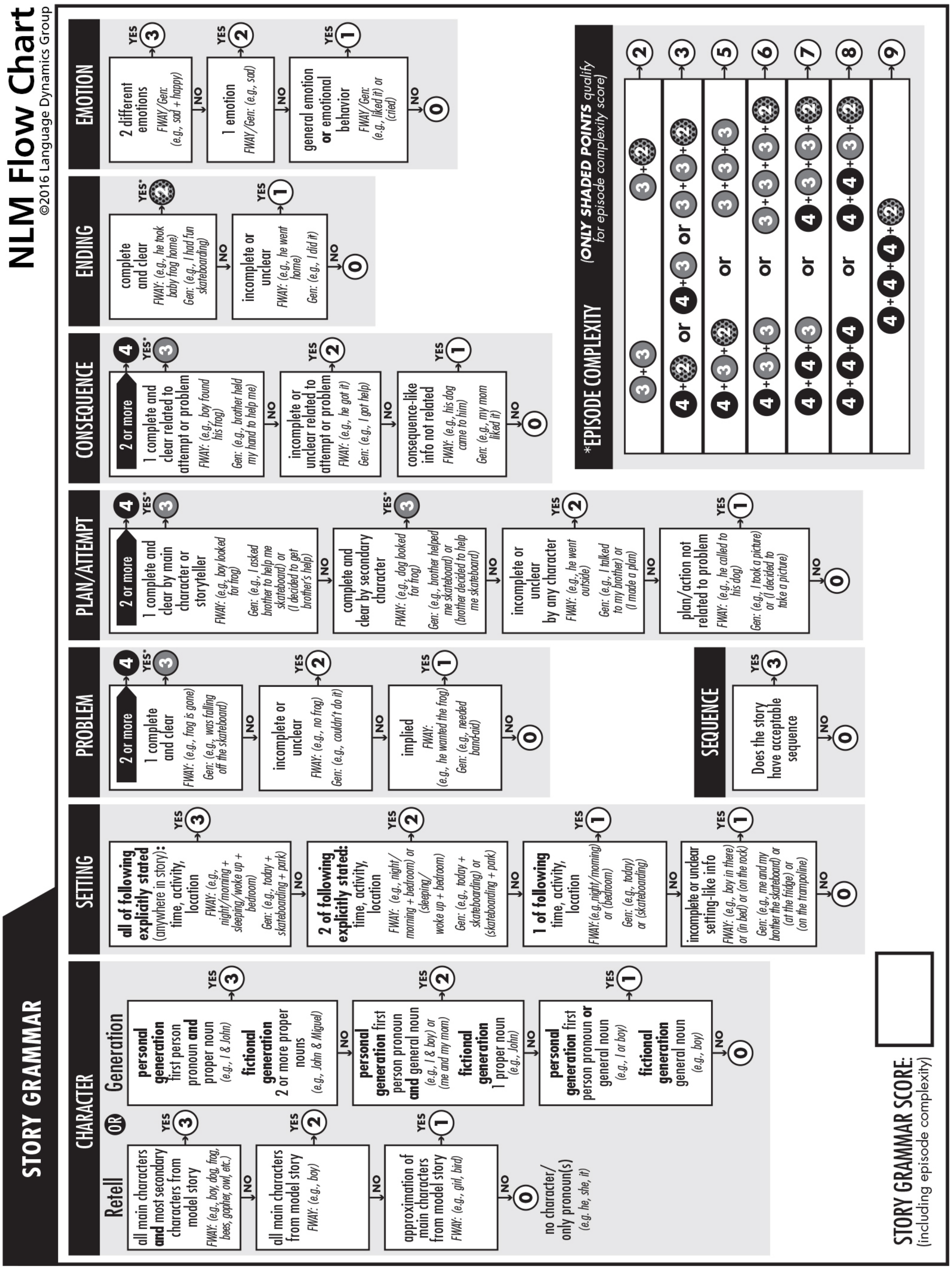


Figure 2.2: NLM Flow Chart – Story Grammar and Episode Complexity



Setting

Three main elements need to be mentioned to score a total 3 points; time, activity, and location. The order in which they are mentioned does not affect scoring. An example of a full setting would be: “It’s night time and the boy and dog were sleeping in the bedroom”. 2 points are awarded when two of the elements are explicitly stated: ‘They woke up in the bed room’. 1 point is awarded when one element is explicitly stated ‘It is night time’. 1 point is also awarded if setting-like information is incomplete or unclear ‘The boy was in there (meaning the bed)’. 0 points are awarded in the case where no of the above is mentioned.

Problem/Initiating Event

This includes problems and any initiating event that is essential to the story line. As all the Frog stories have multiple problems/initiating events, when one clear element is mentioned, a score of 3 points is given. If more than one problem/initiating event is mentioned, a score of 4 points is given. An example of a 3-point problem/initiating event would be: ‘when they were sleeping, the frog snuck out the window”. An incomplete or unclear problem is awarded 2 points: ‘no frog’. If a problem is implied then1 point is awarded: ‘he wanted the frog’. 0 points are awarded in the case where no problem is mentioned.

Plan/Attempt

This is defined as a plan or action that includes the use of mental state words and is a direct response by the main or secondary character to solve the previous Problem/Initiating event. One clear and complete plan/attempt receives a score of 3 points, more than one receives 4 points. An example of a 3-point Plan/Attempt: “when they woke up they started to look for the frog”. 3

points are also awarded regardless of whether the Plan/Attempt is carried out by a main character 'the boy looked for the frog' or a secondary one 'the dog looked for the frog'. An incomplete plan or one that is unclear is awarded 2 points: 'he went outside'. 1 point is awarded if a plan/attempt is not related to the problem 'he called to his dog'. 0 points are awarded if not plan/attempt is included.

Consequence

These are a direct result of the Plan/Attempt in the story. They either result in more problems that need to be resolved providing a multi-episode story or they lead to the story ending. An example of a 3-point consequence: "They found the frog with a family of frogs in the pond". When 2 or more clear and complete consequences are included, 4 points are awarded. 2 points are given when an incomplete or unclear consequence is included: 'he got it'. 1 point is given when consequence-like information is related 'his dog came to him' and 0 points given when no consequence is mentioned.

Ending

Follows the consequence and is the culmination of the story. The highest scoring is 2 points: "They thanked the family for taking care of the frog and went back home". 1 point is given for an unclear or incomplete ending such as "he went home". 0 points are awarded when an ending is not mentioned.

Emotion

These are scored based on they type of emotional words used. The highest 3 points is given when 2 different emotion words are used such as ‘sad’, ‘scared’ or ‘angry’. 2 points are awarded when only 1 emotion word is used such as ‘sad’. 1 point is awarded when a general emotion ‘liked it’ or an emotional behavior ‘cried’ is mentioned. If no emotion words are mentioned, the participant is scored 0.

Sequence

When a story is presented in a sequential manner that is logical, meaningful and acceptable it receives 3 points. The sequence however, does not have to follow the above outline. A story that does not have acceptable sequence scores 0 points.

Episode Complexity

Episode complexity is scored a minimum of 2 points and a maximum of 9, based on the combination of story grammar elements that a participant may or may not have mentioned. Additional points are allocated when two or more of the following elements are integrated in the story: Problem, Plan/Attempt, Consequence, or Ending. Therefore, the more elements a story contains, the more complete the episode is and the higher the score assigned to it will be. For example, to be scored the minimum of 2 points, a participant needs to have mentioned two of the following: one Problem, one Plan/Attempt or one Consequence. 2 points can also be awarded if only one Problem/Plan-Attempt/Consequence is mentioned along with a clear and complete Ending. To be scored the maximum of 9 points, the participant needs to have mentioned 2 or more Problems, 2 or more Plans/Attempts, 2 or more Consequences and one Ending. All elements have to have been clear and complete with the highest scores in the story grammar section.

Language Complexity

This section contains language features that reflect oral language skills expected of primary school students, between 7 to 11 years of age. For language complexity, the NLM flow chart scores for prepositions, verb/noun modifiers, vocabulary/rhetoric, temporal ties, causal ties, and dialogue, with possible scores ranging from 0 to 3, with a total possible score of 17.

Prepositions

Up to three prepositions are needed to receive the full three points for this element. Examples include *over, from, under, with, at, to* and *down*. 2 points are awarded for two prepositions, and 1 point awarded for one preposition.

Verb/Noun Modifiers

This section is scored for the presence of relative pronouns *that, who, which, who's,* etc. and descriptive modifiers (adverbs and adjectives) such as '*extremely* tall'. 3 points are awarded if both a relative pronoun after a noun exists in the text as well as a descriptive modifier. 2 points are awarded for two consecutive descriptive modifiers or a relative pronoun after a noun. 1 point is awarded for one descriptive modifier before or after a verb/noun.

Vocabulary/Rhetoric

More points are awarded when less common vocabulary is used such as *scrambled* instead of *ran* or *terrified* instead of *scared.* These are words that are complex, colourful and interesting, with the ability to capture the listeners attention and are subjectively determined by the examiner based on the simplicity of the language used by the participant in the rest of the narrative, which may also reflect a participants degree of English language exposure. 3 points are awarded when 3 or more less-common words/idioms/analogies/metaphors/similes are used. 2 points are given for the inclusion of 2 less-common vocabulary and one point is given for the inclusion of 1 less-common vocabulary.

Temporal Ties

Scores are based on the use of one or more temporal subordinating conjunctions such as *when, after, before* and *while* and these receive 3 points. Though coordinating conjunctions do not lead to the production of a subordinate clause, they may reflect a sense of time within a narrative. Therefore, the use of less common temporal coordinating conjunctions such as *meanwhile, earlier* or *finally,* scores 2 points. One or more common coordinating conjunctions such as *next* or *so (then)* receive 1 point.

Causal Ties

The use of three or more causal markers such as *because, so (that)* and *since* receives 3 points. The use of two subordinating causal ties receives 2 points. The use of one subordinating causal tie is awarded 1 point.

Dialogue

Any dialogue included by the main or secondary characters receives the full 2 points for this subcategory where at least two different speakers need to be included. 1 point is awarded for one quoted speaker.

2.7.2 Deviation

Deviation from the narrative script is defined as the inclusion of bizarre or irrelevant information in the stories and is characteristic of children with autism (Loveland, McEvoy, & Tunali, 1990). To measure this deviation, the number of statements made by each child not included in the original SALT transcript for the generation story were counted and recorded.

2.7.3 Microstructural Measures

A total of six measures were included, the first four of which are structural measures of overall story length that reflect narrative productivity; total number of words (TNW), Communication units (C-Units), mean length of C-units (MLCU) type token ratio (TTR), number of mazes, and referential accuracy. Table 3 provides a summary of the coded microstructural elements.

Table 2.3

Summary of Coded Microstructure Measures

Narrative Measure	Element	Score
Sentence Productivity and Syntactic Complexity	TNW	-
	C-Units	-
	MLCU	-
	TTR	-
	Mazes	-
	Referential Accuracy (Cohesion)	-

Total Number of Words (TNW)

The TNW included additional morphemes such as plural –s, third person singular –s, past tense –ed, and present progressive –ing. Repetitions, hesitations, unintelligible utterances, and questions asked directly to the examiner were not included. Common phrases such as 'The end' were also excluded as they added no relevant information to the narrative and could affect the other measures of structure.

C-Units

C-units were calculated according to the procedure outlined in SALT (saltsoftware.com). It involves splitting each narrative into main clauses with all subordinate clauses attached to it, with a clause defined as a statement containing both a subject (noun phrase) and a predicate (verb phrase). Furthermore, clauses that are linked together by coordinating conjunctions were to be segmented into two C-units as they are considered to be main clauses and can stand alone; this includes coordinating conjunctions such as: and, but, so (not "so that"), and then, then. For example, the sentence 'The frog was watching the boy play and then he jumped on the boat' would be split into two C-units, the first being 'The frog was watching the boy play' the second being 'and then he jumped on the boat'. Subordinating conjunctions on the other hand link a main clause and a subordinate clause, i.e., these utterances cannot be split into two C-units. Common subordinating conjunctions include: because, that, when, who, after, before, although, while, as, how, and since. An example would be 'The boy was crying because his boat was broken'. This utterance is coded as one C-Unit as it includes a main clause 'The boy was crying' and a subordinate clause 'because his boat was broken'. The word "because" will never begin an utterance (unless preceded by the utterance of another speaker which did not occur in the instances of these narrative productions).

Mean Length of Communication Units (MLCU)

The MLCU was calculated by dividing the total number of words by the number of C-units and is a measure of syntactical complexity and productivity. A higher MLCU indicates a higher level of language proficiency (Paul, 2007).

Type Token Ratio (TTR)

The TTR is calculated by dividing the total number of different words in a narrative (types) by the total number of words (tokens). The range falls between 0 and 1 with a high TTR indicating a high degree of lexical variation and a low TTR indicating a low degree of lexical variation. One drawback of using TTR to compare children on lexical diversity is that it relies on sentence length which may differ from child to child confounding the results, therefore it is recommended to standardise the number of tokens before computing the final ratio (Richards, 1987).

Mazes

Mazes were calculated by counting the number of pauses, repetitions, revisions and incomplete utterances produced within each narrative.

Referential Accuracy (Cohesion)

References made to the three main protagonists, (boy, dog, frog) were analysed for referential accuracy. There were four instances in which referencing was coded; when characters are introduced for the first time, when they are reintroduced after other secondary characters have been presented, when characters have been maintained as a confirmation of identity, and finally, ambiguous or unclear pronouns. During introductions, it is more appropriate to use an indefinite noun for example: ‘There is a boy and a dog and a frog’ as it does not assume prior knowledge of the characters. Definite pronouns are expected when reintroducing the main characters for example: ‘The dog was chased by bees’. Pronouns or zero anaphors are more apt to maintain character reference after reintroduction. Zero anaphor is when a pronoun is omitted, for example: ‘The frog looked at the boat, He decided to jump on it’ will become ‘The frog looked at the boat, and ø decided to jump on it (ø indicates zero anaphor).

Each noun phrase, personal, demonstrative pronoun, zero anaphor, and possessive suffix were coded as being clear or ambiguous. A reference is considered clear if it is supported by previous context, for example: ‘The boy stood on a branch, but *he* didn’t know it was a deer’s antlers’. In this case, it is clear that the word *he* is referencing the boy. In the example, ‘The boy saw the dog. He was angry’, the word *he* is ambiguous, i.e., it is unclear if the word is referring to the boy or the dog. Referential accuracy is calculated as a percentage of the number of clear references made out of the total references for each narrative.

2.7.4 Evaluation Devices

The narratives were coded for six evaluative devices that serve to provide a more cohesive and well-rounded story. The system developed by Bamberg and Damrad-Frye (1991) has been used to determine the evaluative devices. Frames of mind, character speech, hedges, negative comments, emphatic remarks and causal connectives. Two scores were calculated for this measure; total number of frame of mind references, and total number of evaluative devices (a summation of all 6 devices coded). Frames of mind include references to the emotional states of characters that include both verbs (e.g., ‘laughed’) and adjectives (e.g., ‘happy’). Cognitive states also included verbs (e.g., ‘think’, ‘want’, ‘know’) and adjectives (e.g., ‘decided’) were also included with frames of mind as they reflect beliefs and desires and require the narrator to inference the characters mental state, which is not clear from the images. Character speech could be either direct speech ‘The boy called “frog, where are you?”’ or indirect speech ‘The woman told the frog to go away’. Hedges are words and phrases such as probably/maybe/could be that are used to distance the narrator from the story indicating uncertainty about the narrative. Negative comments are statements that reflect surprise or information that contradicts the characters expectations for example: ‘The boy did not know it was a deer’s antlers’. Emphatic remarks are words used to emphasise a certain action or feeling experienced by the protagonist and secondary characters. For example ‘*such* a long time’, or ‘*very.* Finally, causal connectives are markers that highlight the child’s ability to integrate information in the story to explain an emotion or a behavior, for example: ‘He cried because his boat was broken’. Table 2.4 below provides a summary of each element and the scoring system for it.

Table 2.4

Summary of Scoring System for Evaluation Devices

Narrative Measure	Element	Score
Frames of Mind	Emotion and Cognitive words	1 point per word
Evaluation Devices	Character speech	1 point per word
	Hedges	1 point per word
	Negative Comments	1 point per word
	Emphatic Remarks	1 point per word
	Causal Connectives	1 point per word

2.8 PROCEDURE

2.8.1 Participants in the ASD Group

After the signed forms of consent were sent back to school, the school counselor proceeded to call each parent who had consented, to inform them that an envelope with three questionnaires would be sent home in their child's backpack, the SCAS-P (further discussed in Chapter 3), the AQ-C, and the bilingual questionnaire. Instructions were placed for the parents on the top of each form on how to proceed and what was expected. It took a total of three weeks for all the parents to return the filled out forms to the school psychologist who was acting as a liaison between the parents and the researcher. In three cases where parents took over one week to return the forms, they were called up by the researcher and asked if they had any concerns. All three parents asked for clarifications regarding some of the items on either the SCAS-P or the AQ-C and these were explained over the phone.

In each school, a room was made available to be used for data collection, either a speech and language therapy room, or a meeting room. The school counselor would then bring each child in individually after having notified the teacher of the purpose of his or her absence. The ADOS-2 was the first test to be administered by the researcher; its informal approach to testing and use of play materials acted as an icebreaker and allowed the participants to feel more at ease before moving onto other tasks.

2.8.2 Participants in the TD Group

For participants in the TD group, parents were called by the researcher and a time to meet was set over the phone. 17 parents asked that the assessments be conducted at home where a quiet room would be made available for assessment. The remaining three asked to meet at Kuwait University where an office would be used. At the time of assessment, parents were given the envelope with the SCAS-P, the AQ-C, and the bilingual questionnaire to fill out in the time where their child was being assessed in a separate room. In several cases parents waited until the session with their child was complete before asking for clarifications on some of the questionnaire items. As the TD group were not administered the ADOS-2, a short conversation where the examiner asked the participant to talk about their favorite games preceded the actual data collection procedure as an endeavor to get them comfortable. Testing for all participants took between 1.5 to 2 hours depending on how well the child was doing. The sessions were split into two with a 15-minute break in between. Following their respective introductions, the presentation of the tasks for both groups was similar starting off with narrative retell, then narrative generation, Ravens' nonverbal IQ, and ending with the CELF – 4.

2.9 ANALYSIS STRATEGY

An independent samples t-test was run on five variables, age, CELF Core Language, Ravens nonverbal IQ, Arabic bilingual and English bilingual scores to determine whether the ASD and TD groups were well matched and which variables needed to be controlled for in the main analysis. A descriptive analysis was then run on all data to calculate mean and standard deviation values (Table 2.5). This was followed by a Multivariate Analysis of Covariance (MANCOVA) to analyse between group differences (ASD and TD) on the narrative generation task. The MANCOVA looks at the influence of one independent variable (IV) that consists of two or more levels, on two or more dependent variables (DVs) while removing the effect of one or more covariate factors. This is done by first conducting a regression of the covariate variables on the DVs, eliminating the effect of the covariates from the analysis. A MANOVA (multivariate analysis of variance) is then run on the residuals from the analysis (the unexplained variance in the regression model), which tests whether the IVs still influence the DVs after the influence of the covariate(s) has been removed. In the case where the overall multivariate test is significant, univariate tests for each DV are run and examined to interpret their individual effects on the IVs, i.e., a follow-up process of identifying the specific dependent variables that lead to the significant overall effect.

Diagnosis was entered as the 'between-subjects' IV for analysis, with two levels, ASD and TD. The raw score of Core Language was entered as a covariate. The DVs were the eight measures gathered from the narratives including MLCU, TTR, mazes, referential accuracy, frames of mind, total evaluation devices, deviation and story grammar. Though the total number of words (TNW) and the number of C-Units were collected, only MLCU was included in the statistical analysis as it is calculated by dividing the TNW by the number of C-Units and is representative of these two measures. A statistically significant result indicates a significant difference between the IV groups with the level set at $p < .05$.

The Shapiro-Wilk's test for normality was run on the residuals for each of the eight DVs for both the ASD and TD groups. Six of these eight narrative measures violated the assumption of normality where $p < .05$. Though the MANCOVA requires the residuals to be approximately normally distributed, it is considered to be fairly robust to deviations from normality, and as the participants in each group are nearly equal, with 19 in the ASD group, and 20 in the TD group, then only strong violations of normality are considered a problem (Laerd Statistics, 2017). Also, non-normality does not considerably affect Type I (false positive) error rate (Glass, Peckham, & Sanders, 1972). When transforming data, the hypothesis being tested changes, as well as the values initially measured which questions the integrity of the subsequent data interpretation (Gelman & Hill, 2007; Grayson; 2004). For the above reasons, it has been concluded that the best course of action is to proceed with the MANCOVA using the original data points. Effect sizes were also calculated, with 0.2, 0.5, and 0.8, translating to small, medium and large effect sizes (Cohen, 1988).

2.10 RESULTS

The independent t-tests indicated that no statistically significant differences were found in mean age scores, $t(33.251) = .240$, $p = .812$, in the mean IQ scores, $t(37) = 61.72$, $p = .094$, in the mean Arabic bilingual scores and $t(29.8) = -.164$, $p = .87$, and in the mean English bilingual scores, $t(37) = -1.951$, $p = .06$, between ASD and TD (Table 2.5). There was a statistically significant difference in mean Core Language score between ASD and TD, $t(37) = 6.314$, $p < .001$. As a statistically significant difference between the two groups was found on language scores, and narrative abilities are the variables being measured, language was included in the statistical analysis as a covariate to account for any possible effect it may have on narrative performance.

Table 2.5

Participant Characteristics

	Diagnosis			
	TD (n = 20)		ASD (n = 19; 8-15.9 *yrs*)	
Demographics & Assessments	*M*	*SD*	*M*	*SD*
Age	11.8	2.1	11.2	2.8
Age Range (years)	7,4 – 15,1		8 – 15,9	
Autism Quotient (AQ)	49.8	19.4	75.3	18.5
CELF (language)	162.6	26.6	103.9	31.3
Ravens SPM (Nonverbal IQ)	59.7	26.1	45.8	24.2
Arabic* (%)	83	16.3	83.7	9
English* (%)	70	13.8	79	14.9

TD = typically developing, ASD = autism spectrum disorder, n = number of participants, M = mean, SD = standard deviation, CELF = clinical evaluation of language fundamentals (raw scores), Ravens (Nonverbal IQ) = Ravens Standard Progressive Matrices (percentile scores)
* These values reflect the average percentage of Arabic and English each group uses on a daily basis at home among immediate family members, and at school with friends.

The means, adjusted means, standard deviations and standard errors of all eight measures on the generation task for the ASD and TD groups are shown in Table 2.6. The mean values in bold indicate that the values are statistically different between groups. As there was no statistically significant difference between the mean scores for age and IQ between the two groups, these were not controlled for. There was a statistically significant difference between ASD and TD groups on the combined dependent variables of the generation task after controlling for language, $F(8, 28) = 3.176$, $p < .001$, Wilk's $\Lambda = .327$, partial $\eta^2 = .673$

Table 2.6

Means, Adjusted Means, Standard Deviations and Standard Errors for the Eight Narrative Measures for Each Diagnosis Group+

	Diagnosis			
	TD (*n* = 20)		ASD (*n* = 19)	
Generation Narrative Measures	*M (SD)*	*M*adj *(SE)*	*M (SD)*	*M*adj *(SE)*
Story Grammar	**66.9 (9.3)***	**61.8 (2.6)***	**36.7 (9.8)***	**43.4 (2.5)***
Deviation	**.45 (1.1)***	**.39 (.51)***	**3.9 (2.4)***	**2.4 (.49)***
Mean Length of C-Unit	9.4 (1.9)	8.4 (.54)	7.3 (1.5)	7.6 (.52)
Type Token Ratio	.34 (.04)	.34 (.02)	.33 (.07)	.36 (.02)
Number of Mazes	22.8 (17.1)	22.4 (6.9)	29.7 (22.4)	32.1 (6.6)
Referential Accuracy	**92.1 (5.6)***	**90 (5.5)***	**71.4 (22.2)***	**70.1(5.3)***
Frames of Mind	3.9 (3.4)	3.1 (1.3)	5.1 (4.4)	5.3 (1.3)
Total Evaluation Devices	10.2 (6.4)	9.6 (2.1)	12.6 (6.3)	11.3 (2.1)

* $p < .05$ indicating a significant difference between the ASD and TD group

+An independent sample t-test was run on the above eight measures without controlling for language and statistically significant differences were found between ASD and TD on MLCU, Referential accuracy, Story Grammar and Deviation variables.

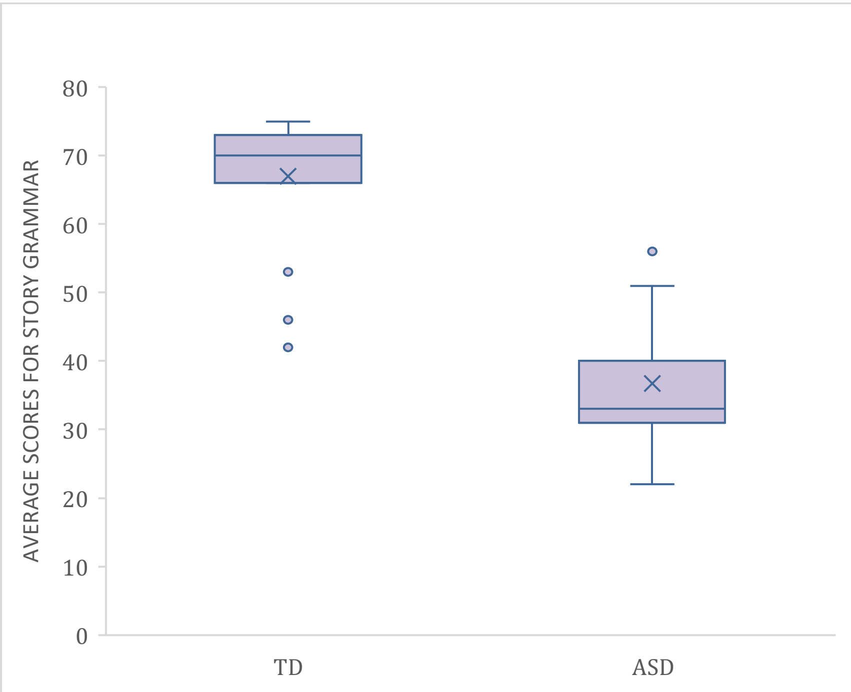
There was also a statistically significant interaction effect between Diagnosis and language ($F(8, 28) = 2.377$, $p = .043$, Wilks' $\Lambda = .596$, partial $\eta^2 = .404$), indicating that a person's performance on the CELF language test is affected by which diagnostic group they are in, ASD or TD. This is most likely a reflection of the CELF scores, where the TD participants outperformed the ASD group on the language test with a significantly higher mean score. Follow up univariate one-way ANCOVAs were performed using Hochberg's step-up procedure, a pairwise comparison that is more powerful than the Bonferroni correction (Guo, 2009).

2.10.1 Macrostructure

A statistically significant difference was found in adjusted means for story grammar between the two groups with a moderate effect size ($F(1.35) = 26.653$, $p = .000$, partial $\eta^2 = .432$) (Figure 2.3). The TD group had higher mean and adjusted mean values ($M = 66.9$, Madj = 61.8) than the ASD group ($M = 36.7$, Madj = 43.4) indicating that the narratives of the TD participants contained significantly more story grammar elements than that of the ASD participants.

Figure 2.3

Boxplots for Story Grammar Between TD and ASD

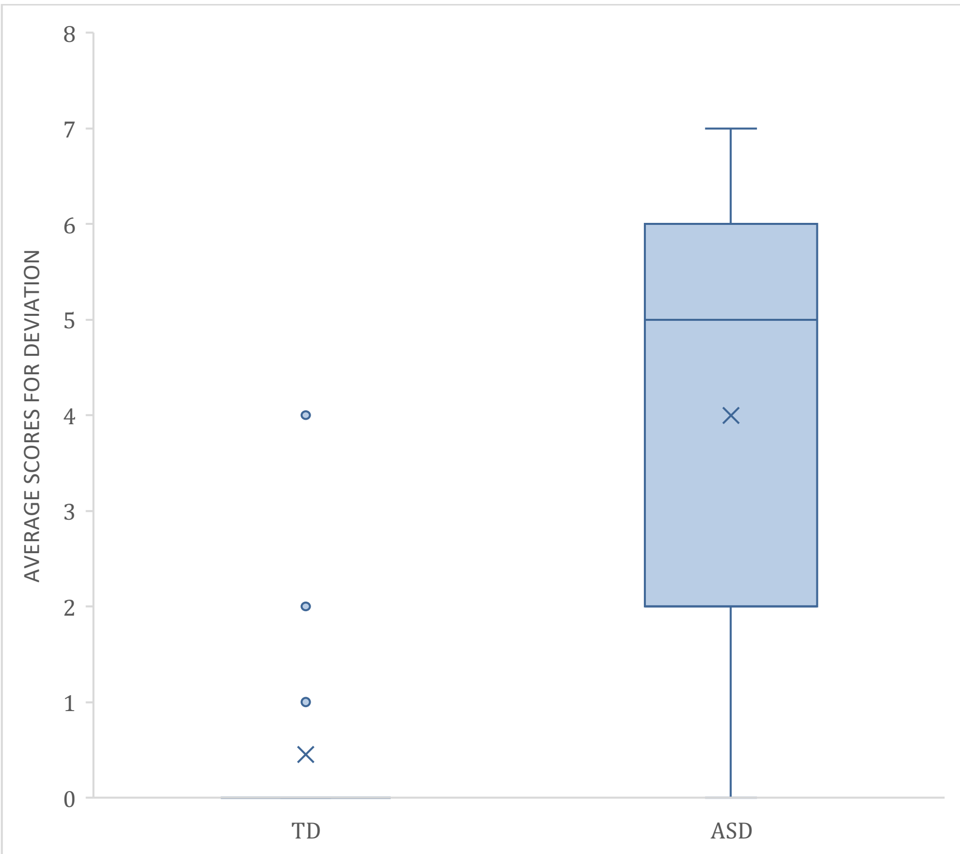


2.10.2 Deviation

A statistically significant difference was found in adjusted means for deviation between the two groups with a small effect size (F(1,35) = 8.326 , p = .007, partial η^2 = .192) (Figure 2.4). The ASD group (M = 3.89, Madj = 2.43) had higher mean and adjusted mean values than the TD group (M = .45, Madj = .39). This indicates that the participants in the ASD group more often added details to their narratives that are not pertinent to the original story than the TD participants.

Figure 2.4

Boxplots for Deviation Between TD and ASD

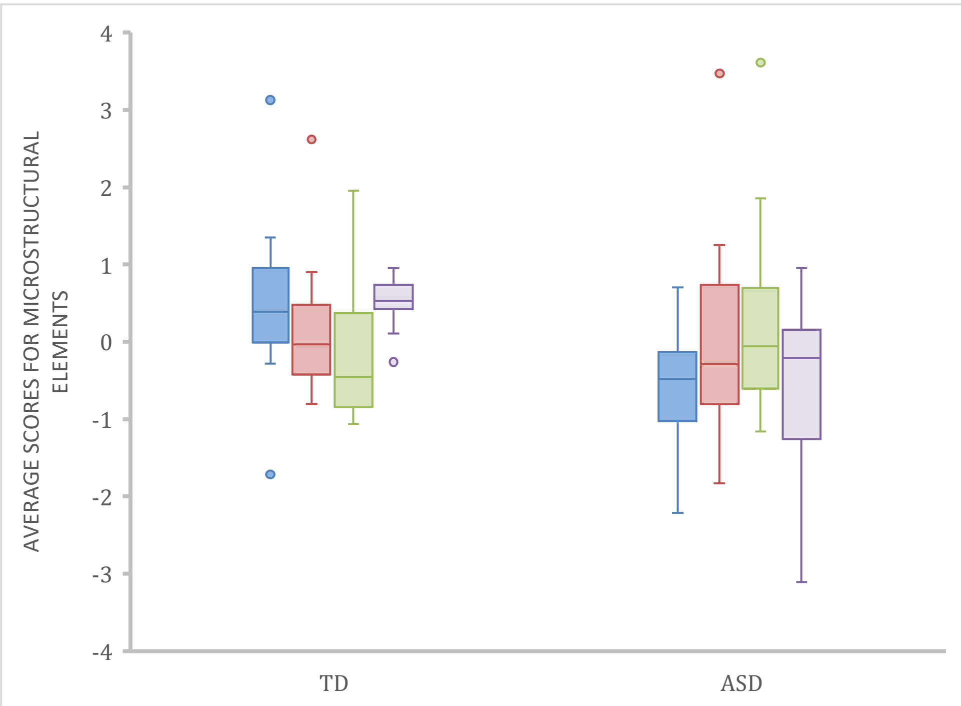


2.10.3 Microstructure

No statistically significant differences were found between the ASD and TD group on MLCU (F(1,35) = 1.203 , p = .280, partial η^2 = .033), TTR (F(1,35) = .451 , p = .507 , partial η^2 = .013) and number of mazes (F(1,35) = 1.045, p = .314, partial η^2 = .029) (Figure 2.5), despite the TD group scoring higher on MLCU and TTR than the ASD group and the ASD group producing on average more mazes (Table 6). A statistically significant difference was found in adjusted means for referential accuracy between the two groups with a small effect size F(1,35) = 6.861, p = .013 , partial η^2 = .164). Mean and adjusted mean values indicate the participants in the TD group (M = 92.1, Madj = 90) were more accurate in their use of references towards characters than the participants in the ASD group (M = 71.4, Madj = 69.4).

Figure 2.5

Boxplots for Microstructure Elements Between TD and ASD

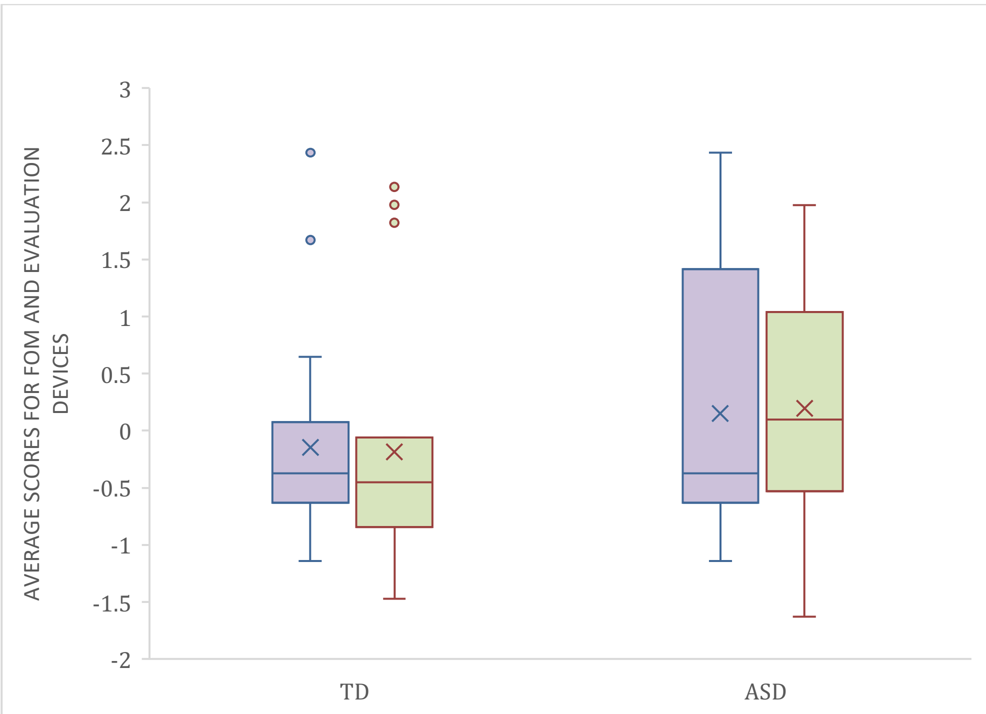


2.10.4 Frames of Mind and Evaluation Devices

No statistically significant difference was found for frames of mind between the two groups ($F(1,35) = 1.470$, $p = .233$, partial $\eta^2 = .040$) (Figure 2.6). The ASD group had higher mean and adjusted mean values ($M = 5.1$, $M\text{adj} = 5.3$) than the TD group, ($M = 3.9$, $M\text{adj} = 3.1$) indicating that the ASD participants used more words to refer to a characters cognitive and emotional states of mind than the TD participants, yet the difference was not significant. No statistically significant difference was found for the total evaluation devices between the two groups ($F(1,35) = .325$, $p = .573$, partial $\eta^2 = .009$) though the ASD participants did have higher mean and adjusted mean values ($M = 12.6$, $M\text{adj} = 11.3$) than the TD participants ($M = 10.2$, $M\text{adj} = 9.6$).

Figure 2.6

Boxplots for Frames of Mind and Total Evaluation Devices Between TD and ASD



2.11 DISCUSSION

This chapter examined and compared the narrative abilities of Kuwaiti children with ASD to their TD counterparts on narrative macrostructure, microstructure, and evaluation devices. This is the first comparative study of its kind that explores language in Kuwaiti children. The results indicate that within the narrative measures evaluated, children with ASD have poorer referential accuracy, poorer story grammar performance and tend to deviate more from the main story compared to TD peers. No differences were found on remaining microstructural elements as well as total evaluation devices. Language was also found to be a significant predictor of how well participants perform on these narrative tasks based on their diagnosis. As the question initially posed in this chapter relates to how the narrative performance between ASD and TD differ, the main effects of the results will be the focus of the discussion.

2.11.1 Macrostructure

The ASD population performed significantly poorly on story grammar compared to the TD group when language was controlled for. This is in line with previous findings demonstrating that children and adolescents with ASD include a significantly fewer number of core story grammar elements than their TD peers (Goldman, 2008; Makinen, et al., 2014; Norbury, Gemmell, & Paul, 2013). However, it contrasts with previous research where global structural measures were considered insufficient in distinguishing children with language impairment from TD ones (Losh & Capps, 2003; Diehl, Bennetto, & Young, 2006; Norbury & Bishop, 2003). It is important to note that age plays a role in how well a child is able to narrate a story using intact story grammar elements, and previous studies have included children as young as 6 years old in their samples which may influence the ability to detect differences. It has been indicated that even by 10 years of age, TD children may not be able to deliver appropriate story endings (Berman & Slobin, 1994) and are only able to produce more complex narratives by 11 years (Berman, 2009). 42% of the participants in the ASD group are under 10 years of age, with an average of 11.2 years. The performance of the younger participants may have influenced the results leading to an overall deficient performance on SG elements on the part of the ASD group. Though there is an expectation that story narrative skills will improve as a person gets older (Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008) there is considerable heterogeneity of language abilities in the ASD population (Tager-Flusberg, 2004), which may indicate why some studies find differences between groups while others do not.

To narrate a coherent story with intact temporal and causal sequences of events, good organizational skills and focused attention are required (Ygual, Rosello, & Miranda, 2010). These tools of executive functioning, including planning and working memory, have been found to be limited in children with ASD and form a basis for the cognitive deficits they display (Demetriou et al., 2017). It has also been suggested that cognitive overload may also affect the oral construction of narratives in children with autism (King, Dockrell & Stuart, 2014). That is, constructing a narrative requires the management of cognitive demands that are equally important, and require simultaneous attention, and children with autism appear to struggle with this aptitude resulting in narratives that are deficient in various areas. This indicates deficits in the EF skills of planning and attention and therefore, it is unsurprising to see that the ASD group did not deliver narratives as sophisticated as their TD peers. Though the participants performed similarly on some aspects of the local level, their impoverished macrostructural abilities are an indication of weak central coherence (Frith, 1989) with a predisposition towards focusing on aspects of local details while showing inaptitude in putting these details together to form a well-structured narrative. It should be noted however, that the explanations to why the data is presented the way that it is, are speculative as neither EF nor CC were directly measured in this study.

2.11.2 Deviation

Children with ASD were observed to deviate more often from the story line by including irrelevant information or adding details that did not serve the narrative such as referring to the dog in the FWAY narrative as the 'King of Kissing' or in the FOHO story when the woman picnicking shouts at the frog 'get out of here you, you idiot piece of paper, piece of stupid diaper baby'. Their tendency to embellish their narratives with additional details, was significantly different to their TD peers, and is in line with previous findings (Losh & Capps, 2003; Diehl, Bennetto, & Young, 2006; Makinen, et al., 2014), yet contradicts others (Norbury & Bishop, 2003). As deviation is considered a discourse feature (Makinen et al., 2014), the finding of a significant difference is not surprising as the tendency for children with ASD to go off topic by adding irrelevant details may have affected their ability to relate the necessary story grammar elements for a coherent narrative.

2.11.3 Microstructure

There was no difference in the length of the narratives produced by the two groups after controlling for language. Though children in the ASD group had shorter narratives, they still performed closely to the TD group. These findings are similar to previous research where no significant differences were found (Losh & Capps, 2003; Diehl, Bennetto, & Young, 2006). Not all published works concur, however, as others report that the length of stories produced by TD children are significantly longer and ultimately more complex than children with ASD (King, Dockrell, & Stuart, 2013; Norbury & Bishop, 2003; Makinen, et al., 2014). A similar pattern was seen with lexical variety, where the TD group did produce narratives that were more complex than the ASD group, however it was not a significant difference, indicating that the vocabulary of children with ASD is as rich and as varied as that of their peers. King et al., (2013) report a significantly lower use of different word roots in their study. The differences in these findings may be attributed to the age of participants and the variables on which groups are matched. Losh and Capps (2003) recruited children of a comparable age to this study (8 – 14 years) who were matched on verbal IQ, which may explain the similarity in findings. On the other hand, King et al., (2013) recruited older participants matched on an expressive language measure and requested a personal generation of event narratives without the support of any images which is reputed to be more difficult (Peterson and Spencer, 2016) and may account for the different results generated.

The narratives of children with ASD did include more mazes than the TD group, indicating that children with ASD are less fluent than their peers, however this difference was not significant. King et al. (2013) reports that their ASD participants had significantly fewer mazes than the control group. However, their participants also produced narratives that were structurally impoverished compared to the TD group, i.e., they were shorter, less descriptive and less grammatically complex, unlike the findings of this study where no difference was indicated in length. The similarity in narrative length production in the TD and ASD groups may have reduced the opportunities for revisions and repetitions and overall use of mazes by the ASD group, resulting in a non-significant difference.

The overall increased use of additional information within discourse by the ASD group should predict the creation of less coherent and poorly structured stories (Norbury et al., 2013). This was the case with the findings of this study as the results indicate that the participants in the ASD group are significantly poorer in using referential cohesion. The literature concurs and suggests that narratives of children with ASD are less coherent than those of controls, and that referencing is a good tool to differentiate between children with ASD and their TD peers due to the high numbers of ambiguous nouns used by the former group (Baixauli, et al. 2016; Norbury & Bishop, 2003; Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008; Goldman, 2008; Norbury, Gemmell, & Paul, 2013). This may be in relation to poor working memory, a skill of executive function, and poor central coherence, as well as poor ToM skills as referencing is a multidimensional task that requires a narrator to keep track of previous context, while determining what the listener currently knows simultaneously as the story is progressing (Baltaxe & D’Angiola, 1992). One study from Finland, however, reports that children with ASD did not differ from TD children in referential accuracy (Makinen, et al., 2014). Nevertheless, the lack of supportive findings in their case may be due to the nature of the Finnish language and it’s use of colloquial, ambiguous pronouns that can refer to males, females and inanimate objects as well as the young age of their participants (average of 7 years old) as accurate referencing emerges around 8 years of age (Makinen, et al., 2014).

2.11.4 Evaluation Devices

Similarly to Norbury and Bishop (2003), Tager-Flusberg (1995), and Capps et al., (2000), no statistically significant difference was found between the two groups when referring to characters states of mind or in the use of total evaluation devices. This indicates that when matched on age and nonverbal IQ, and when language is controlled for, children in the ASD group are as competent as TD children in using mental state terms in their narratives. Norbury & Bishop (2003), speculate that the lack of a significant difference may be due to participants focusing on narrating what the pictures are showing, i.e., a sequence of actions, and not quite clearly, the emotions and thoughts a character is experiencing.

Multiple measures of narrative skills including length, and use of emotion and cognitive words, have been linked to TOM in adolescents with autism (Tager-Flusberg & Sullivan, 1995). Though ToM was not directly measured, and the use of mental state terms does not encompass all that ToM entails, the performance of the ASD children on the use of emotion and cognitive words has implications towards the presence of ToM in individuals with ASD who require low support. Furthermore, their performance on most of the local measures as well as total evaluative devices was similar to the TD children, yet they fell short on the global structure of the narratives. This indicates that children with ASD have difficulties linking the local aspects of narratives together to form a coherent story, suggesting a deficit in their ability to update their working memory with novel information as well as the organizational aspect of executive function. A deficit in central coherence is also indicated where there is a focus on processing the finer details of a narrative and a difficulty in integrating these details to form a global construct.

2.12 LIMITATIONS AND FUTURE RESEARCH

There are several methodological matters that should be taken into consideration while interpreting these results. First, the fact that the participants are bilingual, and the study was conducted in English and not the native language of Arabic, may have influenced the results. It may very well be that conducting the study in Arabic would have revealed different findings as Arabic is a much more grammatically complex language than English resulting in more differences on a local level. The Arabic language differentiates between females and males in sentence structure, words, verbs and pronouns, with specifications for *you* and *they* in singular, plural, male and female forms, unlike English that does not assign gender to words (Khalil, 2010). That being said, there is no evidence that being bilingual has a negative impact on language development in children with autism (Drysdale, van der Meer, & Kagohara, 2014). Second, it would have been beneficial to include an official test of Arabic language skills. Though there is no Arabic CELF, there is an Arabic PPVT and despite a lack of Kuwaiti norms, it would have provided a direct comparison between English and Arabic and evidence that they are equally proficient in both languages. The necessity of including an Arabic test to determine equal proficiency in both languages was only considered upon the completion of the data collection process after 2 participants expressed they are more comfortable speaking in Arabic than in English. Up until this point, the fact that all participants were enrolled in bilingual schools and the bilingual questionnaire were considered sufficient evidence of equal proficiency. Third, the use of blinding during the coding of the narratives was not used as the researcher was fully aware of which narrative fell under which group based on the codes given to each participant in each group. This may have biased the narrative coding as there is an expectation that the ASD group will have a lower performance than the TD group. That being said, the coding reliability check with an external researcher indicates that the initial coding done was highly accurate. Fourth, as this study is interested in the use of emotion words in children with ASD as well as whether language proficiency plays a role in the development of symptoms of anxiety, the use of emotional valence norms may have been prudent to consider , i.e., the extent to which an emotion is positive, negative or neutral (Teh, Yap, & Liow, 2018). Future studies should include this factor which may provide a link between the use of negative emotion words in children with ASD and increased symptoms of anxiety. Finally, it cannot be concluded that these skills of narrative are unique to children with autism only as children with other developmental difficulties such as developmental language disorder (DLD) or pragmatic language impairment (PLI) were not included in the analysis.

2.13 CONCLUSION

In conclusion, the results of this study have highlighted the similarities and differences on a story generation between children with autism and those who are TD, after controlling for core language. Overall children with ASD have impoverished macrostructural elements and a tendency towards embellishing their narratives with additional information. On a microstructural level, children with ASD produce narratives of similar length, lexical variety, and fluency. They also use mental state terms and total evaluation devices as well as TD children. Children with ASD do exhibit difficulties with referential cohesion, which lends itself to how well the story flows and is understood by the listener on a local level. This combined with their poor story grammar and increased deviation, hinder the delivery of a coherent narrative. These deficits can be explained through the three social and non-social cognitive theories of autism, ToM, EF and WCC.

This reduced proficiency in narrative language may play a role in how anxiety presents in children with ASD, as language is a tool in which people commonly use to understand and express their feelings and emotions, i.e., their state of mind, which also needs to be delivered coherently. The following chapter examines anxiety in detail and explores its' possible link to narrative language skills in children with ASD.

CHAPTER 3

EXPLORING THE RELATIONSHIP BETWEEN NARRATIVE LANGUAGE AND ANXIETY IN CHILDREN WITH ASD: A CORRELATION STUDY

3. INTRODUCTION

In the previous chapter it was established that children with ASD have difficulties with referential accuracy and deviation within microstructure and an overall deficit in story grammar elements (macrostructure) compared to their typically developing peers. They performed similarly to their peers on remaining microstructure elements as well as total evaluation devices. As some studies have indicated that communication deficits are correlated to anxiety levels in individuals with autism, the aim of this chapter is to specifically investigate whether there is an association between narrative skills and current levels of anxiety in children with and without autism and determine which of the variables measured predict anxiety. To do this, four research questions will be answered in this chapter.

Research Questions

1. Is the presentation of parent-reported anxiety symptoms in Kuwaiti children with ASD and TD similar to the international community?
2. Is there a difference in anxiety symptoms between Kuwaiti ASD and TD children that is similar to the international community?
3. Is there a correlation between the three narrative measures which distinguish between children with and without autism (referential accuracy, deviation and story grammar) and anxiety symptoms?

4. Do narrative measures which distinguish between children with and without autism predict parent-report anxiety?

3.1 METHODOLOGICAL DECISION MAKING

The diagnostic criteria for autism and comorbid disorders have changed over the past decade, and measures that were created using previous DSM-IV criteria, such as the SCAS-P, do not wholly reflect the current one, resulting in some confusion that will be addressed next. According to the current Diagnostic and statistical manual of mental disorders-5th edition, (APA, 2013), anxiety disorders include: Separation anxiety disorder (SAD), selective mutism, specific phobia, social anxiety disorder (social phobia), panic disorder, agoraphobia, and Generalised Anxiety Disorder (GAD). Obsessive-compulsive disorder (OCD) is no longer listed as an anxiety disorder in the DSM-5. The SCAS-P used in this study has based its definitions of anxiety disorders on the previous DSM-IV (APA, 2000) where OCD is listed as an anxiety disorder, and therefore, it will still be included in this chapter. Additionally, the previous DSM-IV relates specific phobia to a single fear stimulus (Spence, 1998). The current DSM-5 lists fears of injury as well as other fears such as fear of animals, under specific phobia As the items on the SCAS cover a wide range of specific fears that convey physical injury, the DSM-IV label of specific phobia was replaced with physical injury fears by the authors of SCAS-P (Spence, 1998). For the purpose of defining these disorders below, physical injury fears and specific phobia will be grouped together (Table 3.1).

Table 3.1

Description of anxiety disorders including OCD

Anxiety disorder	Description
Obsessive Compulsive Disorder	Characterised by obsessions that cause marked distress and/or by compulsions, which are performed to neutralize anxiety.
Social Phobia	Characterised by a significant anxiety provoked by exposure to certain types of social or performance situations, which often lead to avoidance.
Panic disorder/ Agoraphobia	Characterised by recurrent and unexpected panic attacks and avoidance of situations that may cause these attacks.
Separation Anxiety	Developmentally inappropriate and excessive anxiety surrounding separation from home or from significant attachment figures.
Physical Injury Fears (Specific Phobia)	Characterised by a significant anxiety provoked by exposure to a feared object, that often leads to avoidance.
Generalised Anxiety	Characterised by at least 6 months of persistent and excessive anxiety and worry.

3.2 METHODOLOGY AND STUDY DESIGN

This is a cross-sectional correlational study. Accounts of the participants, methods and procedure for this study have been covered in detail in chapter 2, section 2.4 – 2.8, therefore only a brief review will be covered here. 19 children with autism who require low support and 20 TD children were recruited from private schools and clinics in Kuwait. They were provided with language, vocabulary, nonverbal IQ, and narrative assessments, as well as two questionnaires completed by parents: an anxiety scale, and an autism quotient (Chapter 2, section 2.5).

Narratives were elicited using two procedures, narrative retell followed by a personal generation rendering two separate narratives for each participant that were transcribed and coded for elements of microstructure, macrostructure, and evaluative devices (Chapter 2, section 2.6).

3.2.1 Measures

Assessing Anxiety

Spence Children's Anxiety Scale - Parent

Parents were required to fill out the parent version of the Spence Children's Anxiety Scale - Parent (SCAS-P) (Spence, 1998) (Appendix H), which assesses the severity of anxiety symptoms in 6 – 18 year olds using 38 items within six domains; obsessive compulsive disorder, social phobia, panic/agoraphobia, separation anxiety, physical injury fears and generalised anxiety. Following initial conversations with participants, it was a concern that the child version of the SCAS may be too difficult for the ASD group to complete accurately, thus the parent version was used instead. The scale is measured on a 4-point likert scale with four options to choose from determining how often the child experiences each item: never = 0; sometimes = 1; often = 2; and always = 3, yielding a maximum possible score of 114 with a recommended cutoff T-score of 60. Though the SCAS is available in Arabic, it was decided to move forward with the English version as all other tests and surveys administered to children and their parents were done so in English. This would allow a maintenance of a linguistic standard across all the tests administered.

The SCAS is also one of the most frequently used anxiety measures in ASD research (Wigham & McConachie, 2014), it is designed to parallel the anxiety disorder criteria of the DSM (Magiati et al., 2017), and is freely available in more than 20 languages making it a cost-effective clinical and research resource. The internal consistency for subscales within the SCAS-P is satisfactory to excellent; an anxiety disordered group ranges from 0.83 to 0.92, ASD groups range from 0.92 to 0.93, and a TD control group ranges from 0.81 to 0.90, supporting their use for research and clinical practice (Arendt, Hougaard, & Thastum, 2014; Nauta, et al. 2004). It is recommended however, that only the total score is used as a general screen for anxiety, as the subscales are inconsistent and remain unclear (Magiati et al., 2017). The total scale reliability for both anxiety and normal groups is high at 0.89. The SCAS-P correlates better with parent reports that internalise symptoms than those that externalise symptoms with a parent-child agreement that ranges from 0.41 to 0.66 in the anxiety group and from 0.23 to 0.60 in the control group (Nauta, et al. 2004).

3.3 PROCEDURE

The SCAS-P was sent home to parents with instructions on how to complete it via the school coordinator along with the Autism Quotient (AQ). For more details on the procedure in administering the SCAS-P, please see Chapter 2, Section 2.8.

3.4 ANALYSIS

To provide a precise presentation of the results, and to better answer the first research question that explored the differences in narrative skills between ASD and TD children, only the data from the narrative generation was used in chapter 2 and will also be used for the analyses in this chapter. The data for narrative retell can be found in Appendix L. First, to get a better understanding of the results, the SCAS-P scores were converted to T-Scores for both groups to provide a point of comparison for anxiety and to determine the rate of anxiety in each group.

Multivariate Analysis of Covariance (MANCOVA): A between-group analysis was run in SPSS (Statistical Package for Social Sciences, Version 25.0) to analyse between group differences on the SCAS-P (For more information on the MANCOVA, please refer to Chapter 2, section 2.9). Diagnosis was entered as the 'between-subjects' IV for analysis, with two levels, ASD and TD. The raw score of Core Language was entered as a covariate as there is a statistically significant difference in mean language scores between ASD and TD, $t(37) = 6.314$, $p = .000$. The DV's were the 6 subscales of the SCAS-P: OCD, social phobia, panic agoraphobia, separation anxiety, physical injury fears, and generalised anxiety - as well as the overall SCAS scores (a total of 7 DV's). A statistically significant result indicates a significant difference between the IV groups with the level set at $p < .05$. Effect sizes were also calculated, with 0.2, 0.5, and 0.8, translating to small, medium and large effect sizes (Cohen, 1988).

The Shapiro-Wilk's test for normality was run on all seven DV residuals for both ASD and TD groups. Five of the seven variables violated the assumption of normality where $p < .05$. Despite this violation, the analysis was continued as only very strong violations of normality are viewed as a problem (Laerd Statistics, 2017) and non-normality does not substantially affect Type I (false positive) error rate (Glass, Peckham, & Sanders, 1972). That being said, the MANCOVA is still considered to be robust in the face of non-normally distributed data (Laerd Statistics, 2017).

Spearman Correlation: Following the preliminary analysis of SCAS scores, a correlation study was conducted to determine the association between the total SCAS score and 7 other variables, Age, IQ, CELF, Autism Quotient (AQ), Referential Accuracy (RA), Deviation (Dev), and Story Grammar (SG). The AQ was used as a predictor instead of diagnosis as the AQ score reflects the range of autistic traits that are present in both groups as some participants in the TD group scored high on the AQ. Raw scores of the SCAS were used instead of T-Scores where the full range of scores is important, as per the recommendation of Achenbach & Rescorla (2001). A test of normality found that four of the variables (SCAS, AQ, Age and SG) were not normally distributed as assessed by Shapiro-Wilk's test ($p < .05$), and therefore, Spearman's rank-order correlation coefficient was used to determine the strength and direction of the association that may exist between these variables.

According to Chen & Popovich (2002), the value of the correlation coefficient varies between +1 and -1. The closer a correlation coefficient is closer to 0, the weaker the relationship will be between the two measured variables. A correlation coefficient closer to 1 indicates a strong relationship. The direction of the relationship is indicated by the sign of the coefficient; a + sign indicates a positive relationship and a – sign indicates a negative relationship. Cohen's standard was used to evaluate the effect size of the correlation coefficient, i.e., the strength of the relationship. A value between .10 and .29 indicates a weak association, values between .30 and -49 indicate a moderate association, and values between .5 and 1 indicate a strong association (Cohen, Cohen, West & Aiken, 2003).

Backward Stepwise Regression: While the hierarchical regression is a more favoured approach to model building, there is a lack of guidance within the theoretical literature on the topic at hand. In this case exploratory model building using stepwise methods is recommended (Field, 2005), A backward stepwise regression procedure was used to determine how much variation within the dependent variable of anxiety, measured by SCAS, can be explained by the seven, above-mentioned, independent variables.

According to Crawley (2012), several principles must be followed to create a model that best fits the data available when conducting a statistical analysis. This includes the model having as few parameters as is possible, a preference to the use of linear models over non-linear ones, the experiment should rely on few assumptions, the model should be simplified to a minimal yet adequate reflection of the data, and it should provide a simple explanation to the results. One of these models is the maximal model, which is the minimal adequate progression of the backward stepwise regression based on steps of deletion (Crawley, 2012). The backward stepwise regression approach begins with a full, saturated model of all predictor variables and at each step the least statistically significant variable (the one with the highest p value) is eliminated from the regression model to find a reduced model that best explains the data (Neter, Wasserman, & Kutner, 1996).

As with any analysis, the backward regression comes with its limitations that make it a less popular choice to other methods. Firstly, it does not consider all possible combination of potential predictors, thereby not guaranteeing the best possible combination of variables. Regression coefficients may appear larger, confidence intervals may appear narrower, p-values may appear smaller and invalid, and R^2 values may appear higher (Harrell, 2015). This is because the model is working its way down instead of up, whereby always retaining a large value of R-squared. Another limitation is that the models selected by this procedure may include variables that are not really necessary to the analysis, as according to Crawley (2012), having spent time and energy in collecting data does not necessitate their inclusion in the model. Countering this is the problem of leaving out important predictors from the model (Field, 2017).

Though the use of the backward stepwise is a divisive choice for a regression (Smith, 2018; Babyak, 2004), it is still recommended over the use of other stepwise regression methods such as the forward stepwise method (Field, 2005) and is endorsed by some researchers (McDonald, 2014; Hastie, 2016). It is also useful in that it reduces the number of predictors and the issue of multicollinearity (Vlachopoulou, Ferryman, Zhou, & Tong, 2013). The use of the full model also has the advantage of considering the effects of all variables simultaneously and the automated variable selection used by stepwise methods is most helpful in explanatory data analysis (Steyerberg, Eijkemans, Harrell, & Habbema, 2001). An explanatory approach includes variables in the model that best reflect the question being asked which is recommended in this case due to the lack of theoretical and empirical basis on which to build a model using a hierarchical regression (Field, 2005). Therefore, the procedure of a backward stepwise regression was run to determine how much variation within the dependent variable of anxiety, measured by SCAS-P, can be explained by the seven, above-mentioned, independent variables, while following the Crawley (2012) steps on how to best build a regression.

Only the variables that best reflect the question being explored were included in the model. As autism traits, language and narrative measures are the main predictors of interest, the AQ, CELF, and three narrative measures of RA, deviation and SG were included as well as three interaction variables between them AQ*RA, AQ*Dev and AQ*SG, to determine what type of influence they have on anxiety, bringing the total number of IV's to eight. For the following analysis, the full model started with all the independent variables of CELF, AQ, RA, Deviation, SG, AQ*RA, AQ*Deviation and AQ*SG. One variable was dropped at each stage to determine which variable best predicts anxiety as measured by SCAS.

3.5 RESULTS

3.5.1 SCAS

Raw scores for each participant were first converted to T-scores based on age and gender, and then mean and SD values were calculated (Table 3.2). The cut-off T-score that indicates elevated anxiety is 60 (Nauta et al., 2004). The overall T-score for the ASD group is 60 indicating elevated anxiety as a whole. Within the subscales, elevated anxiety was indicated for OCD (60) and panic agoraphobia (61), where 53% of participants met the cut-off mark. Elevated anxiety was also reported on separation anxiety (60) and physical injury fears (63), where 37% and 68% of participants scored above the cut-off mark, respectively. Social phobia and generalised anxiety though high were just below the cut-off mark at 56 and 58, respectively. The TD group on the other hand, had an overall T-Score of 55 indicating a normal range of anxiety. Collectively, their T-score of 60 for OCD signifies elevated levels of anxiety on this subscale only, with 45% of the participants meeting the cut-off mark for this subscale.

Table 3.2

T-Score Mean and Standard Deviation of anxiety symptoms for ASD and TD Participants on the SCAS

	Diagnosis			
	ASD (n = 19)		TD (n = 20)	
SCAS Subscales	*M (SD)*	*Number above cut off (%)*	*M(SD)*	*Number above cut off (%)*
OCD	**60 (5.6)**	**10 (53)**	**60 (6.9)**	**9 (45)**
Social Phobia	56 (8.5)	8 (42)	51 (7.4)	2 (10)
Panic Agoraphobia	**61 (6.2)**	**10 (53)**	53 (6.1)	4 (20)
Separation Anxiety	**60 (8.6)**	**7 (37)**	54 (6.7)	3 (15)
Physical Injury Fears	**63 (8.3)**	**13 (68)**	56 (9.1)	6 (30)
Generalised Anxiety	58 (8.4)	7 (37)	56 (8.6)	7 (35)
Total	**60 (7.6)**	**16 (84)**	55 (7.5)	14 (70)

OCD = obsessive compulsive disorder, ASD = autism spectrum disorder, TD = typically developing, M = mean, SD = standard deviation. Bold numbers indicate scores at or above cut-off for clinically elevated levels of anxiety

3.5.2 MANCOVA

The MANCOVA was used to analyse between group differences (ASD and TD) on the SCAS-P. The raw means, adjusted means, standard deviations and standard errors of all seven SCAS DV's for the ASD and TD groups are shown in Table 3.3. There was no statistically significant difference between the SCAS subscales on the combined DV's after controlling for language, F (7, 30) = 1.685, p= .151, Wilk's Λ = .718, partial η^2 = .282. This indicates that though children with autism are reported to experience on average, more anxiety than TD children on a lived basis, when language is controlled for, these differences no longer exist.

Table 3.3

Raw Score Means, Adjusted Means, Standard Deviations and Standard Errors for the Seven SCAS Measures for Each Diagnosis Group

	Diagnosis			
	ASD (*n* = 19)		TD (*n* = 20)	
SCAS	*M* *(SD)*	*M*adj *(SE)*	*M* *(SD)*	*M*adj *(SE)*
OCD	2.7 (2.1)	2 (.67)	2.3 (2.6)	2.9 (.64)
Social Phobia	5.1 (3.7)	5.1 (.89)	3.8 (2.3)	3.8 (.86)
Panic Agoraphobia	2.2 (2.3)	1.8 (.74)	1.2 (2.8)	1.6 (.71)
Separation Anxiety	4.6 (3.6)	3.7 (.85)	2.7 (2.5)	3.6 (.82)
Physical Injury Fears	5.2 (2.7)	5 (.78)	3.8 (2.7)	4 (.75)
Generalised Anxiety	4 (2.7)	3.1 (.72)	3.8 (2.6)	4.7 (.7)
Total	25.9 (12.4)	24 (3.3)	17.3 (10.8)	19 (3.2)

OCD = Obsessive Compulsive Disorder, TD = Typically Developing, ASD = Autism Spectrum Disorder, M = Mean (raw score), SD = Standard Deviation (raw score), *M*adj = Adjusted Mean (raw score), SE = Standard Error (raw score).

3.5.3 Spearman Correlation

The Spearman correlation was conducted to determine the association between SCAS and the seven independent variables of age, IQ, language, AQ, deviation, RA and SG. As the regression that is reported in the following section is run on the two groups combined, which answers the main question asked, the following correlations were also run on combined raw scores for ASD and TD groups, followed by the groups individually to provide a clearer image of how these variables interact with each other.

Combined ASD and TD Correlation Results

The following section details results of the spearman correlation for the ASD and TD groups combined.

A statistically significant, strong positive correlation was found between AQ and SCAS, $r_s(37) = .48$, $p = .002$, indicating that children with higher reported autism traits have higher reported anxiety. (Table 3.4). Statistically significant moderately negative correlations were found between Age and SCAS, $r_s(37) = -.34$, $p = .035$, IQ and SCAS, $r_s(37) = -.33$, $p = .038$, SG and SCAS, $r_s(37) = -.49$, $p = .002$, and RA and SCAS, $r_s(37) = -.45$, $p = .004$, indicating that a person may exhibit more anxiety when they are younger in age with a lower IQ, and have poorer SG and RA scores. A statistically significant moderately positive correlation was found between Deviation and SCAS, $r_s(37) = .40$, $p = .013$, where being more anxious is associated with increased deviation. A statistically significant strong negative correlation was found between CELF and SCAS, $r_s(37) = -.50$, $p = .002$, where being more anxious is associated with poor language scores. When looking at the rest of the graph, it should be worth noting that there is also a significant negative correlation between the AQ and CELF, indicating that having higher Autism traits coincides with lower language skills; a strong positive correlation between CELF and IQ, where having a higher IQ coincides with better language skills.

Table 3.4

Spearman Correlation Between SCAS and Independent Variables for Both Groups

		SCAS	Age	IQ	CELF	AQ	RA	Dev.
Age								
	r_s	-.34*						
	p	.035						
IQ								
	r_s	-.33*	.55**					
	p	.038	<.001					
CELF								
	r_s	-.50**	.29	.66**				
	p	.002	.070	<.001				
AQ								
	r_s	.48**	-.04	-.29	-.68**			
	p	.002	.800	.071	<.001			
RA								
	r_s	-.45**	.30	.41*	.60**	-.32*		
	p	.004	.066	.010	<.001	.045		
Dev.								
	r_s	.40*	-.25	-.46**	-.69**	.46**	-.47**	
	p	.013	.124	.003	<.001	.003	.003	
SG								
	r_s	-.49**	.25	.68**	.86**	-.66**	.63**	-.68**
	p	.002	.126	<.001	<.001	<.001	<.001	<.001

SCAS = Spence children's Anxiety Scale, IQ = Raven's Nonverbal Intelligence Quotient, CELF = Clinical Evaluation of Language Fundamentals – 4th Edition, AQ = Autism Quotient, RA = Referential Accuracy, Dev. = Deviation, SG = Story Grammar

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

<u>*ASD Correlation Results*</u>

The following section details results of the spearman correlation for the ASD group only.

Within the ASD group, small non-significant negative correlations were found between Age and SCAS, $r_s(37) = -.18$, $p = .469$, IQ and SCAS, $r_s(37) = -.06$, $p = .807$ CELF and SCAS, $r_s(37) = -.12$, $p = .622$, RA and SCAS, $r_s(37) = -.20$, $p = .402$, Deviation and SCAS, $r_s(37) = -.003$, $p = .990$, and between SG and SCAS, $r_s(37) = -.24$, $p = .324$ (Table 3.5). A small non-significant positive correlation was found between AQ and SCAS, $r_s(37) = .20$, $p = .434$.

Table 3.5

Spearman Correlation Between SCAS and Independent Variables for the ASD Group

		SCAS	Age	IQ	CELF	AQ	RA	Dev.
Age								
	r_s	-.18						
	p	.469						
IQ								
	r_s	-.06	**.57***					
	p	.807	.010					
CELF								
	r_s	-.12	.40	**.61****				
	p	.622	.093	.006				
AQ								
	r_s	.20	.11	.08	-.41			
	p	.434	.665	.734	.080			
RA								
	r_s	-.20	.18	.01	-.10	.25		
	p	.402	.474	.973	.690	.301		
Dev.								
	r_s	-.003	**-.51***	.54*	**-.62***	.004	.05	
	p	.990	.027	.017	.005	.988	.847	
SG								
	r_s	-.24	.43	**.56***	**.70****	**-.57***	.21	-.36
	p	.324	.067	.012	.001	.011	.382	.131

SCAS = Spence children's Anxiety Scale, IQ = Raven's Nonverbal Intelligence Quotient, CELF = Clinical Evaluation of Language Fundamentals – 4th Edition, AQ = Autism Quotient, RA = Referential Accuracy, Dev. = Deviation, SG = Story Grammar

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

<u>TD Correlation Results</u>

The following section details results of the spearman correlation for the TD group only.

Within the TD group, a statistically significant strong positive correlation was found between AQ and SCAS, $r_s(37) = .49$, $p = .028$, and Deviation and SCAS, $r_s(37) = .49$, $p = .030$ and a statistically significant moderate negative correlation was found between Age and SCAS, $r_s(37) = -.49$, $p = .030$ (Table 3.6). This indicates that within the TD population, those who identify with more autistic traits, deviate more from the main story line and are younger, are more likely to experience anxiety. Despite the moderate negative correlations between IQ and SCAS, $r_s(37)$

= -.43, p = .061, CELF and SCAS, $r_s(37)$ = -.41, p = .072, RA and SCAS, $r_s(37)$ = -.21, p = .366, and SG and SCAS, $r_s(37)$ = - .31, p = .18, these associations were not statistically significant.

Table 3.6

Spearman Correlation Between SCAS and Independent Variables for the TD Group

		SCAS	Age	IQ	CELF	AQ	RA	Dev.
Age								
	r_s	**-.49***						
	p	.030						
IQ								
	r_s	-.43	**.52***					
	p	.061	.018					
CELF								
	r_s	-.41	.46*	**.71****				
	p	.072	.043	<.001				
AQ								
	r_s	**.49***	-.37	-.37	-.44			
	p	.028	.105	.105	.052			
RA								
	r_s	-.21	**.51***	**.47***	.38	-.18		
	p	.366	.022	.038	.096	.456		
Dev.								
	r_s	**.49***	-.07	-.03	-.11	.11	-.14	
	p	.030	.776	.892	.643	.639	.553	
SG								
	r_s	-.31	.29	**.79****	**.64****	-.23	.37	-.10
	p	.180	.215	<.001	.003	.336	.105	.666

SCAS = Spence children's Anxiety Scale, IQ = Raven's Nonverbal Intelligence Quotient, CELF = Clinical Evaluation of Language Fundamentals – 4th Edition, AQ = Autism Quotient, RA = Referential Accuracy, Dev. = Deviation, SG = Story Grammar

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.5.4 Backward Stepwise Regression

The regression procedure was run to determine how much variation within the dependent variable (outcome) of SCAS, can be explained by the following eight independent variables (predictors), CELF, AQ, RA, Dev, SG, AQ*RA, AQ*Dev, AQ*SG.

Assumptions

Initial exploration of the data showed that the assumptions were met.

1. There was linearity as assessed by partial regression plots and a plot of studentised residuals against the predicted values.
2. There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.460. The Durbin-Watson statistic can range from 0 to 4 and a value of approximately 2 indicates that there is no correlation between residuals (Mackinnon, 2008).
3. There was homoscedasticity, as assessed by visual inspection of a plot of studentised residuals versus unstandardized predicted values.
4. One outlier (TD 14) was detected based on Casewise diagnostics with a standardised residual of 3.449 and a residual greater than ± 3 standard deviations. There were no leverage values greater than 0.2, or values for Cook's distance above 1 for all the data. The values entered for participant TD14 were reviewed to eliminate the possibility of data entry errors and none were found. For this reason, and that a high leverage value and high influence value were not indicated with this participant, the case was not removed and the analysis continued (Laerd Statistics, 2015).
5. Despite the SCAS being not normally distributed as assessed by Shapiro-Wilk test of normality (p = .02), the multiple regression analysis is fairly robust against deviations from normality, therefore it is not imperative to perform transformations on non-normally distributed data, as the assumption of normality of residuals has not been inherently violated (Laerd Statistics, 2015).

Regression Results

Starting with the first full model (Step 1), variables were dropped at each consecutive step depending on which measure was least able to predict SCAS scores. The final model (Step 6) indicates that AQ, Deviation and the interaction effect between AQ and Deviation significantly predicted SCAS scores (Table 3.7). The model explains 25.1% of the variance in SCAS scores (R^2 = .251, F(1,34) = .029, p = .016. AQ significantly predicted SCAS scores (β = .297, p = .016), Deviation significantly predicated SCAS scores (β = 7.989, p = .016) and the interaction between Deviation and AQ significantly predicted SCAS scores (β = -.101, p = .016).

Table 3.7

Backward Regression Models Predicting SCAS From AQ, Language, RA Deviation, SG, AQ*RA, AQ*Dev., and AQ*SG

		ΔR^2	*B*	*SE b*	*β*	*p*-value
Step 1	(Constant)	.367	-65.3	62.83		.307
	Language		-.06	.10	-.21	.520
	AQ		1.30	.81	2.41	.117
	RA		1.23	.66	1.91	.071
	Deviation		11.0	7.32	2.26	.145
	SG		-.47	.84	-.69	.579
	AQ*RA		-.02	.01	-2.53	.101
	AQ*Deviation		-.14	.1	-2.37	.158
	AQ*SG		.004	.01	.39	.728
Step 2	(Constant)	-.003	-76.4	53.46		.163
	Language		-.06	.1	-.2	.531
	AQ		1.44	.69	2.67	.044
	RA		1.14	.59	1.76	.063
	Deviation		12.9	4.56	2.67	.008*
	SG		-.19	.22	-.27	.408
	AQ*RA		-.01	.01	-2.26	.084
	AQ*Deviation		-.17	.06	-2.83	.007*
Step 3	(Constant)	-.008	--72.67	52.63		.177
	AQ		1.33	.66	2.47	.052*
	RA		1.03	.56	1.61	.074
	Deviation		12.4	4.42	2.55	.009*
	SG		-.27	.18	-.39	.143

	AQ*RA		-.01	.01	-2.03	.101
	AQ*Deviation		-.16	.06	-2.66	.007*
Step 4	(Constant)	-.045	-85.9	52.87		.114
	AQ		1.41	.67	2.61	.043*
	RA		.96	.57	1.49	.102
	Deviation		12.67	4.5	2.61	.008*
	AQ*RA		-.012	.01	-2.06	.103
	AQ*Deviation		-.16	.06	-2.59	.010*
Step 5	(Constant)	-.059	-.20	13.95		.988
	AQ		.30	.12	.56	.015*
	RA		,02	.11	.03	.866
	Deviation		8.27	3.76	1.71	.035*
	AQ*Deviation		-.10	.05	-1.72	.043*
Step 6	(Constant)	-.001	1.89	6.49		.772
	AQ		.30	.11	.55	.011*
	Deviation		7.99	3.33	1.65	.022*
	AQ*Deviation		-.10	.05	-1.67	.032*

AQ = Autism Quotient, RA = Referential Accuracy, SG = Story Grammar, AQ*RA = interaction variable between AQ and RA, AQ*Deviation = interaction variable between AQ and Deviation, AQ*SG = interaction variable between AQ and SG.
* $p < .05$.

3.6 DISCUSSION

The purpose of this study was to explore the relationship between autism traits, anxiety and narrative language skills in children; a first of its kind. This was done first by examining the presentation of anxiety symptoms in children with ASD and TD and then determining whether a difference between the two groups exists. Results show that once language is controlled for, levels of anxiety experienced by ASD children do not differ greatly from the TD population, indicating that language proficiency plays a role in how parents report the presentation of anxiety. A correlation was then run to determine any associations between specific narrative measures, the multiple variables measured and anxiety. It was found that children are more likely to experience anxiety if they identify with autistic traits, are younger in age and have a lower IQ. Within the scope of language, children are also more likely to experience anxiety if they have poorer language skills, poorer RA and SG scores and deviate more from their narrative. In the ASD group, no correlations were found between narrative measures and anxiety. Within the TD group, having more anxiety is associated with being younger, having more autistic traits and increased deviation from the narrative script. Finally, a regression was conducted to determine which of the narrative variables can be used to predict anxiety and the results indicate that the autism quotient, deviation and the interaction variable between the autism quotient and deviation are significant predictors of anxiety.

3.6.1 Anxiety in the ASD Group

The ASD group reported elevated levels of anxiety on the subscales of OCD, panic agoraphobia, separation anxiety, and physical injury fears, with 84% of the participants meeting the cut-off mark for elevated anxiety levels. 53% of participants in the ASD group indicated elevated anxiety within the subscale of OCD. It should be noted however, that in the DSM-5 (APA, 2013), OCD is no longer categorised as an anxiety disorder (Van Ameringen, Patterson, & Simpson, 2014), as in the ASD population, the behaviors classified as OCD are considered as self-soothing regulators of excitement and most often not associated with anxiety (Scahill, & Challa, 2016; Zandt, Prior & Kyrios, 2007). That being said, previous reports have also shown that 61.4% of individuals with ASD present with a comorbid OCD (Romero et al., 2016). This may be explained by the overlap in behavioral and cognitive symptomatology between OCD and ASD.

53% of the children in the ASD group in this sample met the cut-off criteria for panic agoraphobia. Wijnhoven et al., (2018), who used a Dutch version of the SCAS-P, found a similarly high rate of 56% on the subscale of panic agoraphobia, however, when children rated themselves, the rate dropped to 32.7%. This raises questions into how parents perceive the presence of anxiety in their children, and how the participants in this study would have rated themselves, had they been given the chance. That being said, one study that compared young children and their caregivers when reporting anxiety symptoms using the SCAS-C and SCAS-P versions respectively, found an overall moderately good agreement between the two groups especially on the subscales of separation anxiety, generalised anxiety, and physical injury fears (Magiati, Chan, Tan & Poon, 2014).

The subscale of physical injury fears in the SCAS-P includes specific fears such as fear of heights and of darkness as well as fear of physical harm. For this reason, one study redefined this subscale in the SCAS-P as ‘specific phobia’ (Wijnhoven et al., 2018). It has been repeatedly reported that specific phobia and unusual fears are commonly found in individuals with autism (Wijnhoven et al., 2018; Leyfer et al., 2006; Mattila et al., 2010). The 68% of ASD participants who met the cut-off mark for elevated anxiety levels is concurrent with that of the international community, where a range of 31 – 64% is reported (Mayes et al., 2013).

37% of the participants report elevated levels for separation anxiety. This may be reflective of the younger participants as younger children tend to report higher rates of both OCD and separation anxiety (van Steensel, Bogels & Perrin, 2011; Vasa & Mazurek, 2015). Similar to recent data that reports up to 50% of people with ASD have social anxiety (Spain et al. 2016), 42% of the participants in this ASD group also report symptoms of social phobia. This is slightly lower than the 56% reported by Wijnhoven and colleagues (2018). This rate of social anxiety is to be expected as individuals with ASD commonly report social anxiety at rates that far exceed the 7-13% reported for non-ASD populations (Spain et al. 2018; NICE, 2013). The results of this study concur with previous works on the presence of anxiety disorders in children with ASD yet differ on the specific type of anxiety disorders as the mode of assessment differed, as well as the age of the participants, and severity.

3.6.2 Anxiety in ASD compared to TD peers

The ASD group scored higher on the anxiety subscales and overall score than their TD peers suggesting that ASD children are more anxious on a day to day basis. However, when language was controlled for, the difference was not statistically significant, indicating that language plays a role in parent's reported anxiety in children with ASD. These results differ to a meta-analysis that reports children with ASD who need low support, have higher anxiety levels with a higher risk of developing anxiety disorders (van Steensel & Heeman, 2017), yet it is similar to reports from another meta-analysis that explored anxiety disorders within autism, where studies that include a higher proportion of Asperger's Syndrome (AS), report lower prevalence rates of anxiety. (van Steensel, Bogels, & Perrin, 2011; MacNeil, Lopes & Minnes, 2009). Though the anxiety rates are lower in the AS population compared to other individuals with an ASD, they were still higher than the TD population (van Steensel, Bogels & Perrin, 2011). The lack of a significant difference may be due to the participants recruited for this ASD group requiring a low degree of support, and they were matched well on age and IQ while language was controlled for in the analysis. This is also in line with a recent finding that reports children with higher structural language skills have higher levels of anxiety 6 months later (Rodas, Eisenhower, & Blacher, 2017). It is also worth noting again that no significant difference was found between the participants on evaluation devices that include references to state of mind in the previous narrative chapter. These factors could mean that these participants are able to process their feelings, understand them better, and therefore are more able than individuals with an ASD who require more support, to emotionally express themselves. Though it has been reported that there is no relationship between ToM and anxiety (Hollocks, 2014), and ToM was not directly measured in this study, these implications should be further investigated.

3.6.3 SCAS-P

There is evidence to suggest differences in anxiety ratings given by parents of children with ASD compared to self-ratings, as well as by parents of TD children. Parents have been shown to rate their child's anxiety more severely than the child themselves (Blakely-Smith et al., 2012; Storch et al., 2012) while adolescents' rate themselves higher than their parents would, (Hurtig et al. 2009). Though the parent rates presented are similar to previously published parent-rates, it may very well be that they are exaggerated and do not reflect the true levels of anxiety of the participants. To ensure that anxiety rates are measured accurately, it has been suggested that multi-informant and multi-method gathering approaches be used, i.e. having parents, teachers and professional service providers such as psychologists complete various anxiety screening and diagnostic assessments for each participant, where appropriate (Magiati et al. 2017).

It has also been hypothesized that the symptomatology of anxiety in ASD may be atypical, or dissimilar to how anxiety presents in people without ASD (Kerns & Kendall, 2012). As the SCAS was developed to measure anxiety in the TD population, there are concerns that the SCAS is not able to capture items that are specific to the phenomenology of anxiety in autism. To address this, a relatively new assessment of anxiety by Rodgers et al. (2016) called the Anxiety

Scale for Children-ASD (ASC-ASD) that examines more ASD-related anxiety difficulties and includes parent and child versions was created.

3.6.4 General Correlations

The results of the correlation study indicate that children are more likely to experience anxiety if they have more autistic traits, are younger in age, have a lower IQ, poorer language, RA and SG scores and deviate more from the narrative. There were no significant correlations between anxiety and any of the variables measured in the ASD group. The significant correlations found in the data when the groups are combined appear to be driven by the TD group, as within the TD group, those who were younger and have more autistic traits and deviated more from the narrative were more likely to experience anxiety. As a regression was conducted on the combined groups following the correlation, the focus of the correlation discussion will be on the combined groups.

The results indicate that those who present with more autistic traits are more likely to experience anxiety, which is in line with findings in this study where children in the ASD group scored on average higher than the TD group on the SCAS-P scale, yet the differences between the groups were accounted for with language. This was in particular the case for children who are TD. As children who are TD are expected to be more adept at communicating using language and conducting themselves appropriately in social situations, it may be that those who have autistic traits and experience difficulties because of them, whether at school or at home, will ultimately be more anxious. This is in line with research that indicates children with autism are more anxious than TD children (van Steensel et al. 2011). The lack of a correlation within the ASD group may be due to a lack of variance in the scores on the autism quotient (AQ), as the scores of the ASD children were clustered within a smaller range, which was not the case for the TD group. Also, the high AQ scores in the TD group suggests that some participants in this group may experience difficulties comparable to those experienced by children with ASD which may account for their significant correlations.

Younger participants are also more likely to experience anxiety than older ones, specifically the TD participants. This is in line with previous research that shows anxiety to decrease with age in the normal population as childhood anxiety may give way to other psychopathological issues in adolescence such as depression (van Steensel et al. 2011). It is surprising to have not found a significant correlation within the ASD group as has been previously related, where anxiety symptoms, as reported by parents, were more prevalent among younger participants with ASD (Wijnhoven et al. 2018). The relatively small number of participants recruited for this study compared to the 172 participants recruited by Wijnhoven and colleagues (2018) may account for the lack of a significant association here. The lack of an association between anxiety and age in the ASD group may also be explained by the results of a systematic review that found parents report milder anxiety symptoms in younger children with ASD (White et al. 2009). The type of anxiety disorder being reported on also has an effect on these correlations within the ASD populations, as studies with older participants found higher rates of GAD and lower rates of separation anxiety, and studies with younger participants report higher rates of OCD (Frala, et al 2010; Kearney et al. 2003; Ebensen et al. 2008). These factors coupled with a small sample size and using a scale that was not developed for the ASD population may have resulted in a lack of correlation.

According to the results of this study, children with lower IQ scores are more likely to experience anxiety. This supports previous findings where lower IQ scores within the ASD population were associated with increased rates of overall anxiety (van Steensel et al. 2011) yet it contradicts other findings where children with ASD and lower IQ scores are less likely to experience anxiety (White et al. 2009). It may be that children with a lower IQ have more trouble adapting to their environment and they may become aware that they are struggling where their peers are not leading them to become more anxious. However, as it is difficult to recognise and measure anxiety in children with severe language and cognitive delays, directly interpreting these results is not wholly practical, until valid and reliable methods are created to do so.

3.6.5 Correlations Between Narrative Elements and Anxiety

The results of this study provide new insights into the relationship between anxiety and specific narrative measures. The findings indicate that children who have poorer language skills and low SG and RA scores that tend to deviate from the narrative are more likely to experience anxiety. To successfully interact with another person, intact language skills within the scope of narratives are needed. People use narratives to talk about their experiences and share personal events with others' who may find familiarity in the story. Narratives are also needed to share thoughts, feelings and emotions with others with the intention of delivering a message as well establishing common grounds for a relationship. With the presence of a language deficit, there is a break in this functionality, and this may give way to various anxiety disorders. The inclusion of all story grammar elements is the common structure of a coherent narrative; the failure to produce all the elements may be confusing to the listener and frustrating to the person who is trying to deliver the message if they realize they have not been successful which may result in an increase in anxiety. The same can be said for the tendency to deviate from the main narrative and poor referencing skills. Interspersing a conversation with bizarre or irrelevant details, and the failure to correctly refer to characters while narrating a story produces a narrative that is not coherent and may result in confusion for the listener. The person delivering this incoherent narrative may become aware of this confusion and their inability to convey a comprehensible message resulting in an increase in anxiety.

The results reported here supports previous findings within the TD population and those previously diagnosed with PDD-NOS, where anxiety increases as communication skills decrease (Davis et al. 2011). There have long been associations between communication problems and anxiety. Within the TD population language impairment in childhood has been linked to the development of social anxiety in adulthood (Brownlie, Bao, & Beitchman, 2016). Children with specific language impairment are twice as likely to experience emotional problems and behavioral difficulties than their peers with typical language (Yew & O'Kearney, 2013). Within the autism population, studies that included higher proportions of participants with Asperger's syndrome report lower prevalence rates of anxiety (van Steensel et al. 2011). This can be interpreted, as those who have stronger language skills will experience less anxiety than those who do not, which is similar to the findings here. This ties back to the possible causal pathways that link poor language skills to the development of anxiety. In this case, as narrative production was the modem in which anxiety was being explored, then poor narrative skills may affect a child's ability to make sense of their own thoughts and feelings and affects their abilities to express these feelings to others which culminates in increased anxiety symptoms. The culmination of being younger, with autistic traits, a lower IQ, poorer language skills and increased deviation increase the likelihood of a child experiencing anxiety. These correlations do stem primarily from the TD group and may be a result of the unexpectedly varied abilities they presented with, especially on the AQ and the SCAS-P.

3.6.6 Narratives and Anxiety Regression

The results of the regression deliver a novel perspective into the aspects of language that may predict anxiety. Three variables have been found to be significant predictors of anxiety, explaining the variance seen in the SCAS-P, the Autism Quotient (AQ), deviation, and the interaction variable between AQ and deviation.

It is well established that children with ASD are more likely to develop at least one anxiety disorder in their lifetime and the correlation results have shown that children who have more autistic traits are more likely to experience anxiety. This may explain the ability of the AQ to predict SCAS-P scores of anxiety symptoms. The tendency to deviate from the narrative is also a marker that differentiated participants with ASD from their TD peers and is positively correlated to anxiety, i.e., the more deviation from a narrative, the more likely a child will experience anxiety. It may be that their tendency to add more information to their story is an attempt to compensate for their poor language skills. Surprisingly, the interaction between these two variables is negatively correlated to anxiety, i.e., a child with a high AQ score who deviates more from the narrative, experiences less anxiety. This goes against the correlation results that exist with anxiety when these variables are viewed individually. It would have been expected that children with high autistic traits that deviate more from the topic at hand would experience more anxiety as they may find it difficult to make sense of the emotions that they are experiencing, unable to coherently relate issues that are upsetting to them, failing to explicitly convey the message they are trying to deliver to peers, family members and clinicians. There may be other factors that are involved in this finding, aspects that were not measured in this study, and to better understand why the interaction relates to anxiety in this unexpected way, further research needs to be conducted.

To date there are no studies that have explicitly explored which narrative measures may predict anxiety. However, there is evidence indicating that pragmatic language skills affect levels of anxiety. Within the TD population, children with a range of emotional and behavioral problems including social withdrawal and anxiety, were found to have increased disruptions in the flow of their discourse (Vallance, Im, & Cohen, 1999). Similar findings were reported in clinical populations, where impaired pragmatic language skills in children with ADHD are believed to mediate social impairments which are attributed to anxiety disorders (Staikova, Gomes, Tarter, McCabe, & Halperin, 2013). More recently, a longitudinal study found that children with ASD who require low support and present initially with lower levels of pragmatic language skills including nonverbal communication, conversation initiation and maintenance, would have higher levels of anxiety 6 months later (Rodas et al. 2017). These results indicate that pragmatic language deficits are inversely related to anxiety, which supports the findings in this study as deviation is considered a feature of discourse.

As previously established, both story grammar (SG) and referential accuracy (RA) are effective narrative measures to differentiate between ASD and TD children. Yet they are not able to significantly predict anxiety despite their strong correlation to the SCAS-P. This may be because the regression analysis is looking to find predictors of elevated anxiety; deviation has a positive correlation with the SCAS-P i.e., when one increases so does the other, whereas SG and RA both have inverse relationships with the SCAS-P, i.e., when one increases, the other decreases and vice versa.

As the theories of cognition were not directly measured, it can only be speculated that these difficulties are in relation to poor planning and organisation with EF as well as poor central coherence resulting in the focus on details that are irrelevant to the main narrative and an inability to plan and organize thoughts in a logical way.

3.7 LIMITATIONS AND FUTURE RESEARCH

The findings on this study should be interpreted with caution as reliance on parent perceptions of anxiety symptomatology differ from those of their child (Keen, Adams, Simpson, den Houting, & Roberts, 2019). Furthermore, most people with ASD have difficulties in reporting the information needed to identify their anxiety problems due to cognitive and communicative limitations (MacNeil, Lopes, & Minnes, 2009; Tsai, 2006). That being said, as the participants in this study were linguistically competent, it might have been worth conducting a pilot study to determine whether the children with ASD would have been able to understand the items on the child version of the SCAS and rate themselves.

This study used one questionnaire to measure anxiety symptoms whilst relying on a single informant, which may account for some of the differences between values reported here and previously published works. These differences in anxiety symptoms raise issues on the identification and diagnosis process of anxiety within this population. Specifically, the incidence of diagnostic overshadowing between autism and anxiety due to the similarities in symptom presentation between the two (Tsai, 2006), the overlap between anxiety and other commonly co-occurring psychiatric disorders in autism such as OCD and depression and the reliance on indirect measures such as observations or parent-reports within populations that have language and communication difficulties (Helverschou, Bakken, & Martinsen, 2009). A solution to this dilemma is the incorporation of multiple sources of information (parent and child) and different types of assessment methods (diagnostic scales, standardised scales) to be used simultaneously (White, Oswald, Ollendick & Scahill, 2009). As the SCAS has a child measure, future studies can benefit from using both parent and child versions to strengthen their findings. Furthermore, despite the presence of an Arabic SCAS-P, the English version of the SCAS-P was used to be consistent in implementing this research in one language. The children who were recruited were assessed for their bilingual use of Arabic and English. However, their parents were not and there is no way of knowing how well the English language skills of the parents are and whether they understood the questions of the SCAS-P entirely. Therefore, future studies should factor this in. The small sample size of the ASD group (n = 19) may also have resulted in low variance and power, affecting the ability to find significant correlations within them. Additionally, the initial age range of children to be recruited for this study fell within the age range the AQ-C was designed to assess, 4 to 11 years old. As the data collection process progressed and participants were hard to come by, the ages recruited were beyond the assessment scope of the AQ-C. This may have affected the outcome of the results and necessitates the use of a more appropriate autism screening test in future studies, or the addition of multiple screening tests to strengthen any findings made such as the adolescent version of the AQ for participants who are 12 to 15 years old.

Finally, hierarchical regression is a more commonly used approach to model building and the choice of a backward stepwise regression may be viewed as a limitation. As it is a regression that tests a model on the data without major input from the researcher, i.e. an automatic model selection, it is argued that it prevents a well-thought out model that best reflects the data and the question that is being answered (Harrell, 2015; Smith, 2018). Also, assuming a single test of a pre-specified model may lead to overfitting and the creation of a false confidence in the final model (Smith, 2018). As the current study is an exploratory analysis, the use of this regression is more forgiving (Field, 2017), however, with more researchers looking into the relationship between language and anxiety in both TD and clinical populations, an alternative analysis such as a hierarchical regression that builds a model based on past research and has a more substantiated approach to model building should be considered (Crawley, 2012; Field, 2017; Warne et al. 2012; Osborne, 2000).

3.8 CONCLUSION

This study adds significant new findings to the current understanding of anxiety and language in children and adolescents with autism. The findings of the previous chapter were extended by exploring the possibility of a link between narrative skills and anxiety. Within the scope of the anxiety measure used, it was found that the ASD group experiences more anxiety than the TD group, yet this difference does not exist once language was controlled for. Also, individuals who identify with autistic traits, are younger in age with a lower IQ are more likely to experience anxiety. Of most interest is how the narrative variables measured interact with anxiety. Individuals with poorer language skills, low RA and SG scores, who deviate more from the narrative by adding information that is not relevant, are more likely to experience anxiety. Furthermore, it was found that the three variables of AQ, deviation and the interaction effect between AQ and deviation can predict anxiety. These new findings have a significant bearing on how language deficits should be approached in relation to anxiety within personal and clinical settings for individuals with ASD. From an assessment perspective, these specific narrative language skills should be tested and monitored especially in children who are reported to have high anxiety. From an intervention perspective, this information may aid programmes that are used to treat anxiety such as CBT, understand why not all participants respond to the programme, i.e., their narrative language skills may need to be improved prior to CBT treatment.

The comorbid presence of anxiety with ASD increases the complexity of an already multifaceted disorder. Within the ASD population, anxiety is associated with sleep problems, parental stress, insistence on routine, self-injury, and sensory under- and over-processing (Mazurek, & Petroski, 2015; Kerns et al., 2015; Lidstone et al., 2014; Wigham, Rodgers, South, McConachie, & Freestone, 2015). This adds to the already heavy burden on individuals and family members mentally, emotionally and financially. As a narrative discourse feature, deviation, when viewed individually, is now found to be correlated to, and a predictor of anxiety, therefore exploring ways in which to reduce anxiety using cost-effective, time efficient, evidence-based research is therefore imperative. The next chapter explores the possibility of using narrative intervention that focuses on SG production to reduce deviation, allowing participants to deliver more coherent messages about their feelings and emotions, thereby reducing anxiety.

CHAPTER 4

WILL IMPROVING STORY GRAMMAR REDUCE ANXIETY SYMPTOMS IN CHILDREN WITH ASD?

METHODS AND PROCEDURE OF A NARRATIVE INTERVENTION

4. INTRODUCTION

It has been established that narrative intervention that target story production through macrostructure and microstructure elements using a single subject and multiple baseline approach are successful in treating language problems in children with autism (Gillam, Hartzheim, Studenka, Simonsmeier, & Gillam, 2015; Petersen et al., 2014; Dodd, Ocampo, & Kennedy, 2011). Improving narrative skills has also been indicated to be effective in treating anxiety (Rahmani & Moheb, 2010; Looyeh, Kamali, Ghasemi, Tonawanik, 2014; Cashin, Browne, Bradbury, & Mulder, 2012). Furthermore, an association has been established between narrative skills and theory of mind where children with more coherent and socially cognitively sophisticated stories are able to pass false belief tasks (Curenton, 2004; Guajardo, & Watson, 2010).

The results of the previous chapter have highlighted that the interaction between AQ and deviation may play a prominent role in predicting anxiety levels in children with ASD and TD collectively. This is in line with previous research where language impairment in childhood was linked to emotional/behavioral problems and social anxiety in adulthood (Voci et al, 2006; Brownlie et al. 2016). Bearing these findings in mind, it can be speculated that improving narrative skills by way of focusing on the production of story grammar elements may indirectly reduce anxiety in participants with ASD. This chapter will evaluate the effectiveness of a narrative intervention that uses the repeated telling of personal narratives to improve social cognition within a multiple baseline across participants' single-subject experimental design (SSD). The influence on anxiety as a result of the narrative intervention in three participants with ASD taken from the previously assessed ASD group will also be measured.

4.1 SOCIAL COGNITION

Theory of Mind (ToM) is a social cognitive ability to attribute the cause of an action by surmising mental states from one's own mind and that of others' such as beliefs, intentions, desires, and emotions (Baron-Cohen, 2001). During the design process, a tool was required to effectively measure the generalised effects of the narrative intervention to social cognition. Previous research has shown that there may be aspects of narratives that can predict the manifestation of anxiety and also support attempts in reducing it (Rahmani, & Moheb, 2010; Warren, Emde, & Sroufe, 2000; Anderson, Goldin, Kurita, & Gross, 2008; Lanni, Schupp, Simon, & Corbett, 2012). This involves the ability to talk about emotional states. As a large part of the intervention addresses emotions and inferring mental states, it was reasoned that tools of social cognition that document differences in recognising emotional mental states would highlight whether improvements made in the narrative intervention generalised to social cognition tasks. Two advanced assessments of ToM skills were therefore chosen and will be discussed in further detail later on.

4.2 METHODOLOGICAL DECISION MAKING

A single-subject experimental design (SSED) was used for the intervention. There are two design methods in the forefront of evidence-based practice; randomized control trials (RCT's) and SSED's (Byiers, Reichle, & Symons, 2012). Though RCT's have several benefits towards understanding causal relations, SSED's provide a successful approach to large-group designs. The main goal of SSED's is to determine the existence of a causal relation between the introduction of an independent variable (i.e., the intervention) and a change in a dependent variable (i.e., the outcome) (Levin, O'Donnell, & Kratochwill, 2003). According to Kazdin (2010), SSED's establish practicability in real-life settings while allowing for an individual evaluation of the effect of a treatment. Details of who responded to an intervention and under which set of conditions may be obscured in a group design when only group means and associated effect sizes are reported (Horner et al. 2005). SSED's also emphasize individual progress by obtaining thorough documentation on the participants that do respond to an intervention as well as those that do not. This approach that tailors interventions to the specific needs of an individual with assigned, unique targets makes SSDs ideal for clinical use (Byiers, Reichle, & Symons, 2012). To establish the feasibility of a design and provide research with a reliable, and maintainable clinical outcome, preliminary, small-scale studies should be conducted first before moving to large-scale examinations. This way, researchers are able to determine whether the developed intervention can be implemented with success within the target population (Adlof, McLeod, & Leftwich, 2014).

A multiple baseline, multiple-probe, across participants design allows for the monitoring of more than one subject, behavior, or location over a period of time. They are also appropriate for answering research questions regarding the effects of a single intervention across three or more individuals (Kratochwill et al. 2010). Experimental control is achieved when the targets of the intervention are repeatedly and reliably taught to a single participant or across a small number of participants. As a baseline measure of a target behavior is recorded over multiple sessions, support of consistency can be provided that any improvement seen at the end of an intervention, across participants, is the result of the intervention and not any external independent factor, controlling threats to internal validity (Horner et al., 2005; Yorkston et al., 1999). Also, by having baseline sessions of varying lengths for each participant where the intervention phase is introduced in a staggered manner, the replication of the effects of the intervention demonstrates experimental control (Byiers, Reichle, & Symons, 2012). For the above-mentioned reasons, the intervention was carried out as a multiple baseline, across participants, single-subject design.

4.3 METHODOLOGY

4.3.1 Ethics

Prior to the start of intervention, the research was reviewed by the Research Ethics Committee in the University of Reading and was granted permission to proceed (2016-180-TL).

4.3.2 Study Design

The dependent variables of overall narrative, story grammar scores, language complexity, and emotion scores provided direct outcome measures of the narrative intervention. In the baseline phase, the three outcomes measures, SCAS, FPT, and RMEC were administered prior to intervention. A narrative baseline was also established in this phase using the forms from the NLM: P narrative baseline phase that lasted 3 sessions for Khalid, 5 sessions for Yousef and 8 sessions for Fahad. The FPT and RMEC tests were repeated in every baseline session. The SCAS was handed to parents on the day of the first baseline session and returned to the examiner via the teacher within a week.

The treatment phase lasted 3 weeks for each participant. They were required to individually attend 30-40 minute sessions, three times per week in an allocated speech therapy room within the school. Khalid and Yousef both received 8 narrative treatment sessions, whilst Fahad received 9. Every other day within the treatment phase, a probe session where the FPT and RMEC were administered followed the narrative intervention. This allowed for 5 probe sessions for each participant. The narrative intervention itself targeted general story grammar and specific linguistic complexity measures tailored to each participant based on their performance in the baseline phase. The participants were provided with a structured storyline in which they could repeatedly practice the measures being taught with an opportunity to generate a personal story at the end of each session that would be later transcribed and coded.

The follow-up session required all three participants to come in individually two weeks after the end of the treatment phase for a final 30-minute session where all of the baseline measures of FPT, RMEC, and narrative generation were repeated. Parents also completed the post-treatment SCAS form at this point.

4.3.3 Participants

Following parental and participant consent, three male participants who attend the same bilingual school were recruited for intervention. The participants were selected for their similar performance on language and narrative tests in the correlation study. It was also helpful that they attended the same school as very limited time was left of the school year, allowing the researcher to maintain a weekly schedule where all three participants were seen on the same day without the need to travel between distant schools and the setting up of the materials did not take up time. The school the participants attended combined special needs and mainstream education. Participants take their classes in the special needs unit and during their scheduled twice-daily break they join the rest of the school. All three boys received weekly speech therapy sessions with the school speech therapist. For the sake of this paper, their names have been changed to Khalid, Yousef, and Fahad. Table 4.1 depicts raw and percentile scores (where applicable) collected for each participant from the correlation study.

Age: the start of the intervention (first baseline session) Khalid was 13;11 years old, Yousef was 10;9 years old and Fahad was 9;9 years old. All three boys have previously received speech and language therapy sessions either provided by the school or at a private clinic outside of school hours.

Table 4.1

Summary of Participant Performance on Autism, Language, IQ, Anxiety and Bilingual Tests

	Age (yrs.)	ADOS	CELF	PPVT	IQ (percentile)	SCAS	AQ-C	Bilingual Score*
Khalid	13;11	8 (A.S.)	69	94	29 (8)	58	97	90 - 70
Yousef	10;9	7 (A.S.)	94	79	29 (8)	60	72	80 - 80
Fahad	9;9	9 (Autism)	108	71	29 (63)	61	65	90 – 90

CELF = Clinical Evaluation of Language Fundamentals – 4th Ed (raw scores), PPVT = Peabody Picture Vocabulary Test (raw scores), IQ = Ravens Raw Intelligent Quotient (raw score), SCAS = Spence Children's Anxiety Scale (T-score), AQ-C = Autism Quotient – Child (raw score), A.S. = Autism spectrum, yrs. = years.
* Percentage of Arabic - English language exposure

Autism symptoms: Khalid and Yousef scored 8 (high) and 7 (moderate) on the ADOS, respectively and that is interpreted as indicating Autism spectrum. Fahad scored a high 9, which is interpreted as indicating Autism. These raw scores from the ADOS were mapped onto calibrated severity scores (CSS) to determine severity of autism symptoms relative to age and language level (Gotham, Pickles & Lord, 2009). Khalid scored 5 and Yousef scored 4 indicating that their autism severity is on a similar level. Fahad scored 6 indicating his autism is more severe than his counterparts.

Language: Though the eldest of the three, Khalid had the lowest raw core language score of 69 on the CELF, placing him in the lower range of language functioning. Yousef performed better with a raw core language score of 94, yet still lower than the performance of the typical student of a given age (100). Fahad had the highest CELF core language score of 108 placing him on the higher range of language functioning. On the PPVT, Khalid scored 94, Yousef scored 79 and Fahad scored 71. All three scores place the participants within the extremely low range of vocabulary functioning. Table 4.2 provides the raw and age equivalent scores for the CELF subtests and the age equivalent scores for PPVT for a more detailed consideration of their language skills.

IQ: All three participants had a raw score of 29 on the Raven's non-verbal IQ test (IQ). Both Khalid and Yousef are in the 8th percentile indicating they perform 8% better than children their age. Fahad being the youngest of the three and with a similar raw score is in the 63rd percentile indicating he performs better than 63% of children his age.

Table 4.2

Age equivalent and raw scores – CELF Subtests and PPVT

Participant	CELF						PPVT
	C & FD	RS	FS	WC-R	WC-E	WD	
Khalid	---	4.8 (28)	7 (28)	7.3 (5)	6.4 (3)	9 (5)	5.8 (94)
Yousef	8.3 (44)	4.5 (21)	7 (20)	7.4 (6)	6.4 (3)	---	4.9 (79)
Fahad	7.4 (40)	4.8 (26)	7.3 (31)	7.6 (7)	6.8 (4)	---	4.4 (71)

C & FD = Concepts and Following Directions, RS = Recalling Sentences, FS = Formulating Sentences, WC-R =World Class – Receptive, World Class – Expressive, WD = Word Definition, PPVT = Peabody Picture Vocabulary Test
( ) = raw scores
--- = Subtest is not for the participants age range

Anxiety: Their SCAS raw scores were converted to T-scores based on age and gender. The cut-off point for anxiety on the SCAS is 60 indicating elevated levels of anxiety (Spence, 1998). Khalid scored just below the cut-off point with 58. Yousef scored 60 and Fahad scored 61. The total AQ-C score is calculated by the sum of each item score. The recommended cut-off scores for the autism quotient - child (AQ-C) is 76 out of a possible 150, where 95% of children with AS/HFA score at or above this number, however, 99% of children with HFA also score at or above 66 (Auyeung, Baron-Cohen, Wheelwright, & Allison, 2008). Fahad had the lowest raw score of 65, Khalid had the highest raw score at 97 and Yousef had a raw score of 72.

Bilingualism: In terms of their bilingual abilities, both Yousef and Fahad are exposed to a similar amount of Arabic and English. According to Khalid's questionnaire, he is exposed more to Arabic than to English. Based on the bilingual questionnaire, 83% of the people the three participants interact with speak to them in both Arabic and English, with usually only the nannies speaking to them in English only and grandparents speaking to them in Arabic only. These figures are based on their daily interactions with immediate family members: mother, father, siblings, grandparents, babysitters, and school.

4.4 MEASURES

4.4.1 Narrative Language Measures - Preschool (NLM-P)

Two narrative elicitations were used to assess the participants' skills, one fictional retell and one personal generation. The elicitation procedures were adapted from the Narrative Language Measures (NLM) by Peterson and Spencer (2016) with different stories being used in every baseline, intervention and follow-up session. The NLM is a time efficient tool that is easy to administer and score. It provides the means to monitor language development using relatable content and stories of a consistent length, structure, and language complexity. It also comes with a set of procedures for narrative retell and generation, which is an important factor for this study.

According to the NLM manual, to monitor progress, any grade level can be administered to any student that reflects their current level of performance. The Narrative Language Measures: Preschool (NLM: P; Spencer & Petersen, 2011) was used to measure the narrative retell and narrative generation outcomes. As the preschool version is the only one that comes with images that can be used to support the participants in telling the stories, and presents with the simplest language, it was thought to be the best level to use for this intervention. The images provided by the NLM:P were appropriate to use as they do represent some types of families in Kuwait though not through cultural dress. The events that would unfold highlighted by each story are common to every household in Kuwait, i.e., getting sick, eating a meal, playing in the garden. Furthermore, though time-constraints prevented testing the participants on their ability to understand the level of the stories told, the NLM:P has been illustrated with the intention of supporting the story telling of those who cannot otherwise provide a coherent story, i.e. very young children or those with disabilities, so it was felt to be a good fit for the participants recruited (Petersen & Spencer, 2016). A third subtest within the NLM:P that tested story comprehension was not administered as the focus of intervention was to measure improvements within story grammar and language complexity and their possible generalisation into reducing anxiety. All the stories were audio-recorded and subsequently transcribed and coded for the use of story grammar, language complexity and episode complexity.

4.4.2 Social Cognition

Two tools that have been designed to measure emotion recognition and false belief (inferring emotional and cognitive states) are the Reading the Mind in the Eyes test - Child (RMEC) (Baron-Cohen, Wheelwright, Scahill, Lawson, & Spong, 2001) and the Faux Pas Test (FPT) (Baron-Cohen, O'Riordan, Stone, Jones & Plaisted, 1999) which were administered as probes during the treatment phase of the intervention and were tested 5 times. Based on the participants' performance on language and vocabulary tests, it was felt that they would have a good understanding of the language being used in these tests. Had the participants asked for clarification, they would have been provided with assistance in understanding what was required of them, but this was not the case as requests for further explanations were not asked for.

Reading the Mind in the Eyes Test – Child (RMEC)

The RMEC (Appendix M) – The child version of the RMEC examines social sensitivity by requiring participants to determine the emotions that 28 black and white photos of human eyes are conveying. Each image shows a set of male or female eyes and eyebrows that are conveying different emotions. Participants are presented with an image and four-alternative forced choices of mental state words. Each image is scored 1 for a correct response or 0 for an incorrect response. The total possible score is 28. A correct response rate equal or above 50% indicates that participants are detecting mental states and not making random guesses. The RMEC has poor internal consistency (Voracek and Dressler, 2006; Girli, 2014; Harkness, Jacobson, Duong and Sabbagh, 2010) with acceptable test-retest reliability (Vellante et al., 2012; Khorashad et al. 2015). That being said, the test has been shown to successfully differentiate between groups recognized to differ in their ToM abilities, in particular between those groups with and without autism or Asperger's syndrome (e.g., Baron-Cohen et al., 1985, 1997).

Faux Pas Test (FPT)

The FPT (Appendix N) is a test of social sensitivity designed for children aged 7 – 11 years old. In a study that examined the performance of typically developing (TD) children and children with Asperger Syndrome (AS) on the FPT, it was found that TD children are skilled at faux pas detection, with females performing at a superior level to males. However, children with AS were significantly impaired on the task despite passing first- and second-order false belief tasks (Baron-Cohen, O'Riordan, Stone, Jones, and Plaisted, 1999).

The test contains 10 faux pas and 10 control stories (which do not contain a faux pas). Due to time constraints, only 10 faux pas stories were used in the probe sessions. Each story has 4 questions that test the child's understanding of whether a faux pas has occurred (detection question), which sentence it was (identification question), general understanding of the story (comprehension question), and understanding that the faux pas was a result of false belief and not directed cruelty (false belief question). For each story, the participant scores 1 point for each question answered correctly with a maximum score of 4 per story. To detect a faux pas, the participant must answer all the questions correctly, failure on any one of the 4 questions leads to a score of zero. Below is an example of one of the faux pas stories used and the follow-up questions asked:

All of the class took part in a story competition. Emma really wanted to win. Whilst she was away from school, the results of the competition were announced: Alice was the winner. The next day, Alice saw Emma and said "I'm sorry about your story". "What do you mean?" said Emma. "Oh nothing," said Alice.

Faux Pas Detection Question: In the story did someone say something that they should not have said?

Identification Question: What did they say that they should not have said?

Comprehension Question: Who won the story competition?

False Belief Question: Did Alice realize that Emma hadn't heard the results of the competition?

4.4.3 Anxiety - Spence Children's Anxiety Scale - Parent

The Spence Children Anxiety Scale (SCAS - P) (Spence, 1997) was administered twice, pre and post intervention by sending the forms home to the parents by way of their children. Though this method is not in accordance with a traditional SSD design, and the scale is not appropriate for repeated use across the intervention as a probe, the SCAS is needed to allow a measure of the generalisation of the narrative intervention, or lack of, to children's levels of anxiety symptoms as it has been previously used with success, in measuring anxiety in children with ASD (Grondhuis & Aman, 2012). (For more details on the SCAS, see Chapter 3, Section 3.2.1).

4.5 NARRATIVE CODING

The NLM: P has its own real-time scoring system for each retell and generation task (i.e., the story is simultaneously scored whilst the child is retelling the story). This online scoring system differs from the NLM flowchart previously discussed in that it is much simpler and more targeted, whereas the NLM flowchart takes into consideration various complex utterances and episodes which is not what the narratives produced by participants in the intervention reflect. The online scoring system has a total possible score of 16 for story grammar, a total possible score of 9 for language complexity, and a total possible score of 5 for episode complexity. This gives a total possible narrative generation score of 30.

4.6 PROCEDURE

4.6.1 Target Goals

Taking into consideration the heterogeneous nature of autism, it is important to have a language intervention tailored to each individual. As each participant came into the intervention with different strengths and weaknesses in relation to storytelling, specific targets were drawn for each boy based on their baseline performance the details of which are specified in Table 4.3 below. Treatment targeted personal narrative skills, i.e. the child's ability to narrate personal experiences of a story-like nature highlighting seven story grammar elements; character, setting, problem, feeling (emotions), attempt, consequence, and ending while focusing on emotions. Language complexity skills were also targeted i.e. their use of words such as 'then', 'because', 'when' and 'after'.

Table 4.3.

Individual goals targeted during intervention for each participant.

	Story Grammar	Language complexity
Khalid	Setting Plan/attempt Emotions Ending	Then Because When
Yousef	Plan/attempt Emotions Ending	Because When After
Fahad	Setting Emotions Ending	When After

4.6.2 Narrative Task

To aid the narrative learning process for the participants, the seven story grammar elements were each assigned an icon and individual colour (Appendix O) and introduced only once during the first intervention session in the following manner:

1 I have these coloured icons that we will be using to tell stories.
2 Each colour and shape means something.
3 Purple is for the characters in the story.
4 Orange is the setting and tells us where the story is taking place.
5 Red is for the problem that the character goes through.
6 Blue is for how the character thinks and feels about the problem.
7 Yellow is for what the character does to solve the problem.
8 Light green is for the consequence of the characters actions
9 Dark green is for how the character now feels and how the story ends.

Once the icons are introduced in the first intervention session, they are used repeatedly to help develop the participants' story telling abilities in subsequent sessions. The uses of visual support in narrative interventions have been found to be helpful in narrative instruction (Graves and Montague, 1991; Hayward and Schneider, 2000; McFadden, 1998).

The NLM: P intervention form was then used to elicit retell and generation narratives with a new story presented for every session. The following procedure based on Peterson, et al.'s (2014) individualised narrative language intervention for children with autism was then implemented for each intervention session:

Step 1: Model story with visual supports. The examiner reads a fictional story with picture support while displaying the seven story grammar icons as the story mentions them.

Step 2: Retell with visual support and verbal prompts. Participant retells the story while the examiner assists in assigning story grammar icons to each image as the story is retold and prompts for additional detail. Full verbal prompts are used to help guide the child in the correct format.

Step 3: Retell with visual support and icons. Step 2 is repeated but verbal prompts are removed.

Step 4: Retell story independently. The story is retold for a third time by the participant, without icons or verbal prompts.

5. Generation (of personal narrative). The participant is asked to generate a story based on their personal experience that is similar to the fictional story ("Has something like that ever happened to you?").

6. Retell personal narrative with visual support and verbal prompts. The participant is asked to retell their personal narrative with icons, pictures, and verbal prompts for support.

7. Retell personal narrative with visual support and icons. The participant is encouraged to retell their personal narrative with only icons and pictures as support.

8. Retell personal narrative independently. The participant is encouraged to retell his story without the icons, visual or verbal support.

The narratives were audio-recorded, transcribed and coded for story grammar, language complexity and episodic complexity at steps 4 and 8, respectively. To ensure transcription and coding reliability, 10% of the narratives were checked for accuracy by a licensed speech and language therapist who achieved a high inter-rater agreement of 98% for transcription and 94.2% for coding.

4.6.3 Social Cognition Tasks

As the intervention was conducted during school hours in which the maximum time the students were allowed to attend was 45 minutes, only 10 faux pas stories were used from the FPT (which originally contains 20 stories in total). These were randomly selected in advance of the commencement of the treatment phase. The stories were printed on separate papers and individually laminated. At the start of every session, the examiner would mix the 10 stories and then fan them out face down on the table and instruct the participant to choose one at a time. Once a choice was made, the story was read and the questions asked by the examiner and answered by the participant, it would be placed to the side away from the selection pile and the participant would choose a new story.

For the RMEC, the participants were asked to look closely at each image that was presented on an individual A4 sized paper. The 4 different descriptive words were read out loud to them by the examiner and they were asked to choose which word they thought best represents what the person is thinking or feeling. Responses could be indicated verbally or by pointing. The responses were recorded on a separate form and participants were not informed whether the answers provided were correct or not.

4.7 ANALYSIS

Three forms of analyses were conducted on the data collected from the intervention. The first is a series of graphs that were generated to allow for a visual inspection of any intervention effects. The overall dependent narrative measures of story grammar, language complexity and episodic complexity were plotted over time to allow for a comparison between baseline and intervention. The second set of analyses included three statistical outcome measures further explained below. Using multiple statistical analyses enhances the acceptance or rejection of any results (Logan, Hickman, Harris, & Heriza, 2008). The third analysis was conducted on the SCAS results where T-scores were calculated to determine each participant's level of anxiety followed by a McNemar analysis to determine whether a significant difference can be found between pre and post intervention SCAS scores.

4.7.1 Percentage of Data Points Exceeding the Median (PEM)

The PEM analysis was created to take into account the variability of data points in the baseline phase of a single subject experimental design (Ma, 2006) and improves on the percentage of non-overlapping data points (PND) analysis (Mastropieri and Scruggs, 1985). Though the PND is more commonly used for single subject designs, is simple to calculate and is consistent with a graphical presentation of the data, it comes with ceiling effects making comparisons between interventions difficult (Parker and Hagan-Burke, 2007) and is sensitive to outliers (Riley-Tillman and Burns, 2009) and so the PEM was considered a superior test to analyse the data. The PEM is calculated by locating the median point in the baseline phase and drawing a horizontal line passing from it to the treatment phase (Nourbakhsh & Ottenbacher, 1994). The ratio of treatment phase data points that are above the baseline median point are then calculated and interpreted.

PEM scores range from 0 to 1. A score of 0.9. to 1 reflects highly effective treatment, .7 to .9 reflects moderately effective treatment, less than .0.7 reflects questionable or not effective treatment (Scruggs, Mastropieri, Forness, & Kavale, 1986; Ma, 2006).

4.7.2 2-Standard Deviation Band (2-SD Band)

The 2-SD band is computed by first calculating the standard deviation for the baseline data. This is followed by drawing bands on the graph that contain scores with ±2 standard deviations from the mean. The 2-SD band is considered sensitive to any changes across the baseline and intervention phases of a single-subject design that a variable goes through (Nourbakhsh, and Ottenbacher, 1994). The tables in the following results section that report the 2-SD band scores will show how many data points are above every calculated standard deviation for the variables. A significant change in performance has occurred if at least two consecutive data points in the treatment phase fall above the calculated 2-SD range. A disadvantage to using the 2-SD band method is in the case when there is little to no variation in baseline scores, which will result in a SD deviation of 0. In this case, any improvement within the intervention, no matter how small, will be highly significant.

4.7.3 Concordance Statistic (C-statistic)

The C-statistic is a method of time-series analysis that can be used on as few as 8 observations (Tryon, 1982). The C-statistic is initially used to evaluate baseline data. In the case where the results computed are not significant, the C-statistic is run again on the baseline and intervention data combined. The C-statistic yields a z score in which the normal probability table for z scores is used to interpret it (Nourbakhsh, & Ottenbacher, 1994). A Value of 0.5 and below indicates a poor model and non-significant result. A value between 0.5 and 0.7 indicates a weak model with questionable significance. A value of 0.7 indicates a good model and is significant. A value ranging from 0.8 to 1 indicates a strong model that is highly significant (Hosmer, & Lemeshow, 2000).

4.7.4 McNemar Test

Th McNemar test is a non-parametric statistical test used to determine the presence of differences on a dichotomous dependent variable between two related groups, and can analyse pretest-posttest study designs, matched pairs, as well as case-control studies (Laerd Statistics, 2018). It is essentially a 2x2 cross classification of matched responses to a dichotomous item and its method is simple and quick to implement with high practical power and appropriate confirmatory data analysis for situations dealing with paired dichotomous responses (Adedokun & Burgess, 2012). That being said, when used in non-randomised single-case experiments, researchers must be careful in attributing any response trend seen as an improvement in post-test to the intervention itself, as the response trend may have already been there without the need for intervention. This may be controlled by the random assignment of measurement times to baseline and treatment conditions (Heyvaert, & Onhenga, 2014). A statistical significance level of $p < .05$ indicates the difference between pre- and post-test is statistically significant (Laerd Statistics, 2018).

The next chapter will provide the descriptive, visual and statistical results for the intervention.

CHAPTER 5

WILL IMPROVING STORY GRAMMAR REDUCE ANXIETY SYMPTOMS IN CHILDREN WITH ASD? RESULTS OF A NARRATIVE INTERVENTION

PART A

5. RESULTS

A previously agreed upon number of baseline sessions per participant (3, 6 and 9 baseline sessions respectively) was unachievable due to Yousef being absent on his 6th baseline session, and school closing one day for a public holiday which coincided with Fahad's 9th baseline session. The original design also required that all participants receive 9 treatment sessions, however, Khalid and Yousef received only 8 as school had closed for a public holiday during one of their scheduled treatments (Table 5.1). Table 5.1 shows the number of baseline and treatment sessions each participant received as well as the 5 scheduled probe sessions for generalisation measures.

The following sections will include visual figures and the statistical analysis of the progress seen in all 3 main areas measured within the intervention; narrative generation (NG), which is a composite of story grammar, language complexity, and episode complexity scores; the RMEC, and the FPT for all three participants. Though the stories for the narrative retell (NR) were also transcribed, coded and analysed, their results will not be included in this chapter as the focus is on NG production. The results for NR can be found in Appendix P.

Table 5.1

Schedules of Participant Baseline and Treatment Sessions

Khalid	Yousef	Fahad
Baseline 1	Baseline 1	Baseline 1
Baseline 2	Baseline 2	Baseline 2
Baseline 3	Baseline 3	Baseline 3
Treatment 1 + probe	Baseline 4	Baseline 4
Treatment 2	Baseline 5	Baseline 5
Treatment 3 + probe	Baseline 6 - absent	Baseline 6
Treatment 4	Treatment 1 + probe	Baseline 7
Treatment 5 + probe	Treatment 2	Baseline 8
Treatment 6 – missed, no school	Treatment 3 – missed, no school	Baseline 9 - no school
Treatment 7 + probe	Treatment 4 + probe	Treatment 1 + probe
Treatment 8	Treatment 5	Treatment 2
Treatment 9 + probe	Treatment 6 + probe	Treatment 3 + probe
2 week follow up	Treatment 7 + probe	Treatment 4
	Treatment 8	Treatment 5 + probe
	Treatment 9 + probe	Treatment 6
	2 week follow up	Treatment 7 + probe
		Treatment 8
		Treatment 9 + probe
		2-week follow up

To aid in presentation, the results will be split into three parts. Part A will report the results from the narrative generation, story grammar, language complexity, and use of emotion words. Part B will report any progress made on the RMEC and the FPT. Part C will report the difference in SCAS scores pre and post intervention. Table 5.2 details the baseline and follow-up scores on each measure for each participant as well as the percentage increase gained from baseline to follow-up.

Table 5.2

Baseline and Follow-up Scores for all Participants

Participant	Task	Baseline			Follow-up		Gain
		Mean	SD	Mean %	Raw	%	%
Khalid	NG	6	4.4	20	27	90	70
	SG	4	1	25	16	100	75
	Emotions	0	0	0	4	100	100
	LC	1.3	2.3	15	6	67	52
	RMEC	11	0	39	17	61	22
	FPT	3.3	1.5	17	5	25	8
Yousef	NG	11.4	2.1	38	23	77	39
	SG	8.2	1.3	51	15	94	43
	Emotions	0.4	0.9	10	4	100	90
	LC	1	0	11	3	33	22
	RMEC	15.2	1.1	54	23	82	28
	FPT	8.2	1.3	41	9	45	4
Fahad	NG	15.1	4.4	50	27	90	40
	SG	10	2.8	63	16	100	37
	Emotions	1.5	1.8	38	4	100	62
	LC	2	1.3	22	6	67	45
	RMEC	17.8	1	63	22	79	16
	FPT	13.6	2.1	68	18	90	22

NG = narrative generation (story grammar + language complexity + episode complexity scores) with a total possible score of 30, SG = story grammar with total possible score of 16, Emotions = a total possible score of 4, LC = language complexity with a total possible score of 9, RMEC = reading the mind in the eyes test – child, with a total possible score of 28, FPT = faux pas test, with a total possible score of 20, SD = standard deviation, % = the average percentage score computed from raw scores, Gain = percentage increase from baseline average to follow-up session

5.1 NARRATIVE GENERATION

5.1.1 Visual Analysis

The overall scores in the baseline phase are low for all boys (Figure 5.1). An overall slow and steady increase is seen in the treatment phase with some slight fluctuations in performance. In the 2-week follow-up, all three participants see a general maintenance of higher scores. Below is a breakdown of the narrative generation progress made for each participant which is a combination of story grammar, language complexity and episode complexity scores and a total possible score of 30.

Khalid's performance on this task saw an increase in accuracy by 70%. He starts off the baseline session with scores that continually decline. Then he appears to make gradual but steady progress throughout his treatment sessions, which was maintained in the follow up session with a high score of 90%. The following language samples from the first baseline and the 2-week follow-up sessions portray the development Khalid made on the generation task.

1st baseline session

Sometimes I be sick because I did uh, something. Because I was, because of the wind. And I, I never vomited. Then I vomited from the concert. Then I finished.

2-week Follow-up session

When I was in the playing the ball. I was in the backyard playing a ball with my sister. Then I couldn't catch it because it's too tiny. And I was mad because, because of the ball, tiny ball. When I asked my sister for help. Because for a, for a help. She said she has an idea for a ball. And then, she has an idea for a big ball

And then she, I was happy because I could catch the big ball.

Yousef also started off with a steadily increasing baseline that dropped in the last session giving him an average of 38%. There was a steady increase in accuracy towards the end of the intervention, with a follow-up score of 77%, a gain of 39%. The following language samples from the first baseline and the 2-weeek follow-up sessions portray the development Yousef made on the generation task.

1st baseline session

I am in, I remember. I spelt and then my body she moved. And then I warmed, really. And then I drink water. And then I tell him my sister. And my sister she came. And then on morning, my father he pick up me to doctor in hospital. I remember in night I eat three eggs. And then I warmed. Really I remember it.

2-week Follow-up session

Me in backyard with my dad. And then I have problem. The ball's very small
And then I am sad because the ball is very small. I couldn't catch. And then I say 'I need help'. And then dad say 'I know how to do'. And then he bring the big ball. And then I, when he throw. And then I catch. And then I very happy.

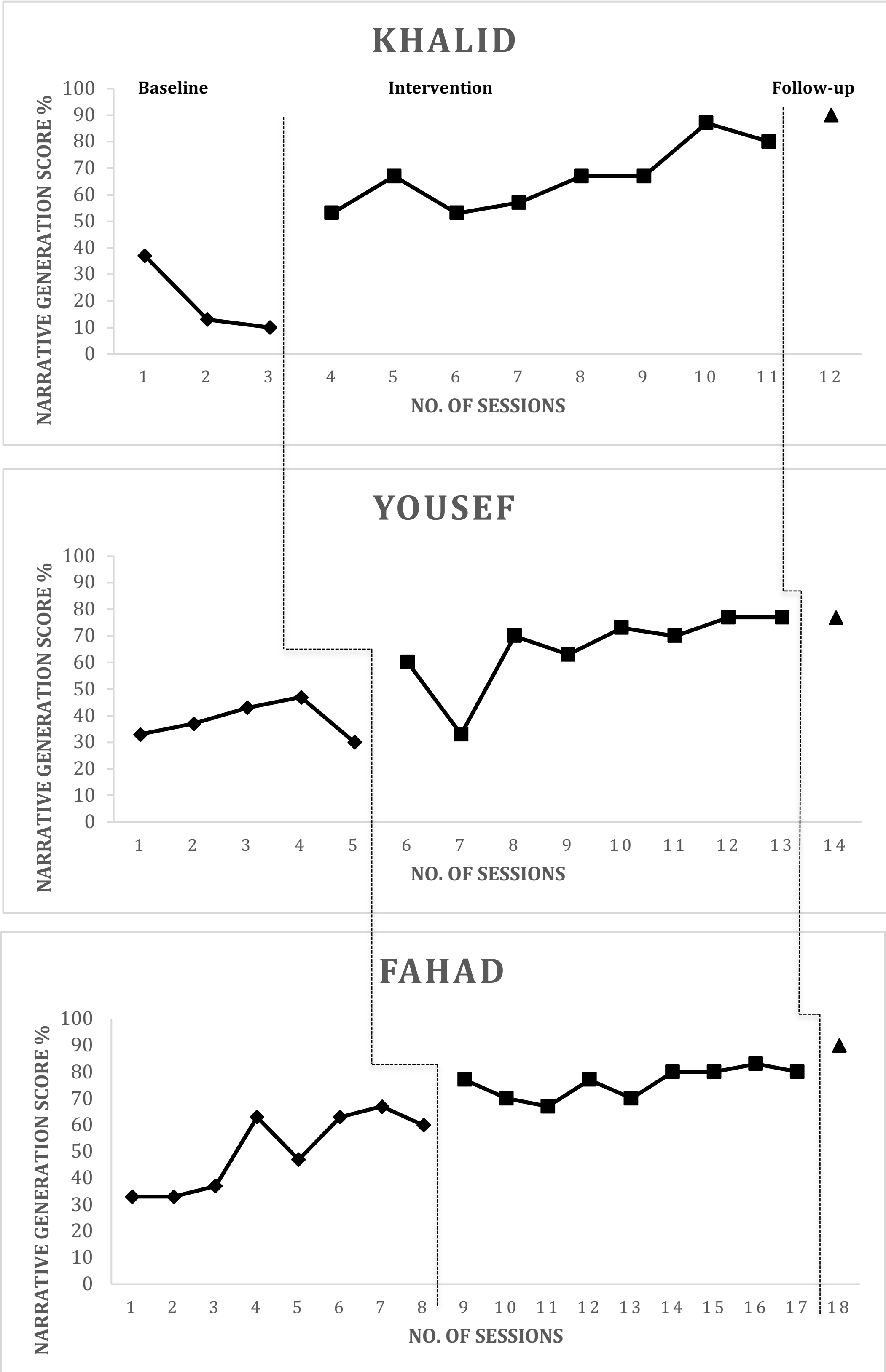
Fahad made gains of 40% towards his follow-up session. His baseline average was 50% and his performance during this phase appears to constantly fluctuate. His performance in the intervention phase shows a slow but steady improvement which was maintained in the follow-up session with a score of 90%. The following language samples from the first baseline and the 2-weeek follow-up sessions portray the development Fahad made on the generation task.

1st baseline session

When I was having fun. Then I, then I coughed. And my sister she sneezed. So we both was sick. I got a delicious medicine. It was my best medicine ever. And my sister got not a nice medicine. And that the story.

Figure 5.1

Narrative generation progress for all three participants



2-week Follow-up session

I was at school learning something. Then it was lunchtime. Then I ate a bite of some food, and I got a, my tooth have hurt. I was sad because my tooth has hurt. Then, after, after lunch, it's 11 o'clock. And we went home. Then I go to my mum's office. And I was hurting my tooth and playing on the computer. I because my tooth has hurt. Then it get out. Then I was feeling happy because I'm gonna put it under the pillow. I sleep, and little fairy would come. But it wasn't real. The end

5.1.2 Statistical Analysis

The improvements that all three participants made on the narrative generation task were seen as significant and highly effective across the PEM, the 2-SD band method and the C-Stat statistical analyses (Table 5.3). The 2-SD band is reported as a percentage, however, when calculating the significance of a result, the 2-SD band considers the presence of at least 2 successive data points in the treatment phase that fall outside the extended 2-SD band. Khalid had 8 consecutive data points above the 2-SD band range, Yousef had 6 consecutive data points above the 2-SD band range and Fahad had 9 consecutive data points above the 2-SD band range.

Table 5.3

Narrative Generation statistical analysis for all three participants

	PEM	2-SD Band (%)	C-Stat
Khalid	1	100	0.9
Yousef	0.9	75	0.7
Fahad	1	100	0.9

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)

2-SD Band interpretation; Green = at least 2 consecutive data points are above 2-SD range = significant change, Blue = no 2 consecutive data points are above 2-SD range = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.2 STORY GRAMMAR

This section explores narratives in more detail by examining story grammar progress within the generation task for all three participants. As story grammar plays an integral part in how people narrate stories about themselves, while providing a guideline of what should be included to make a narrative cohesive, looking at each participants' progress on story grammar may shed light on how effective such an intervention may be in achieving these goals.

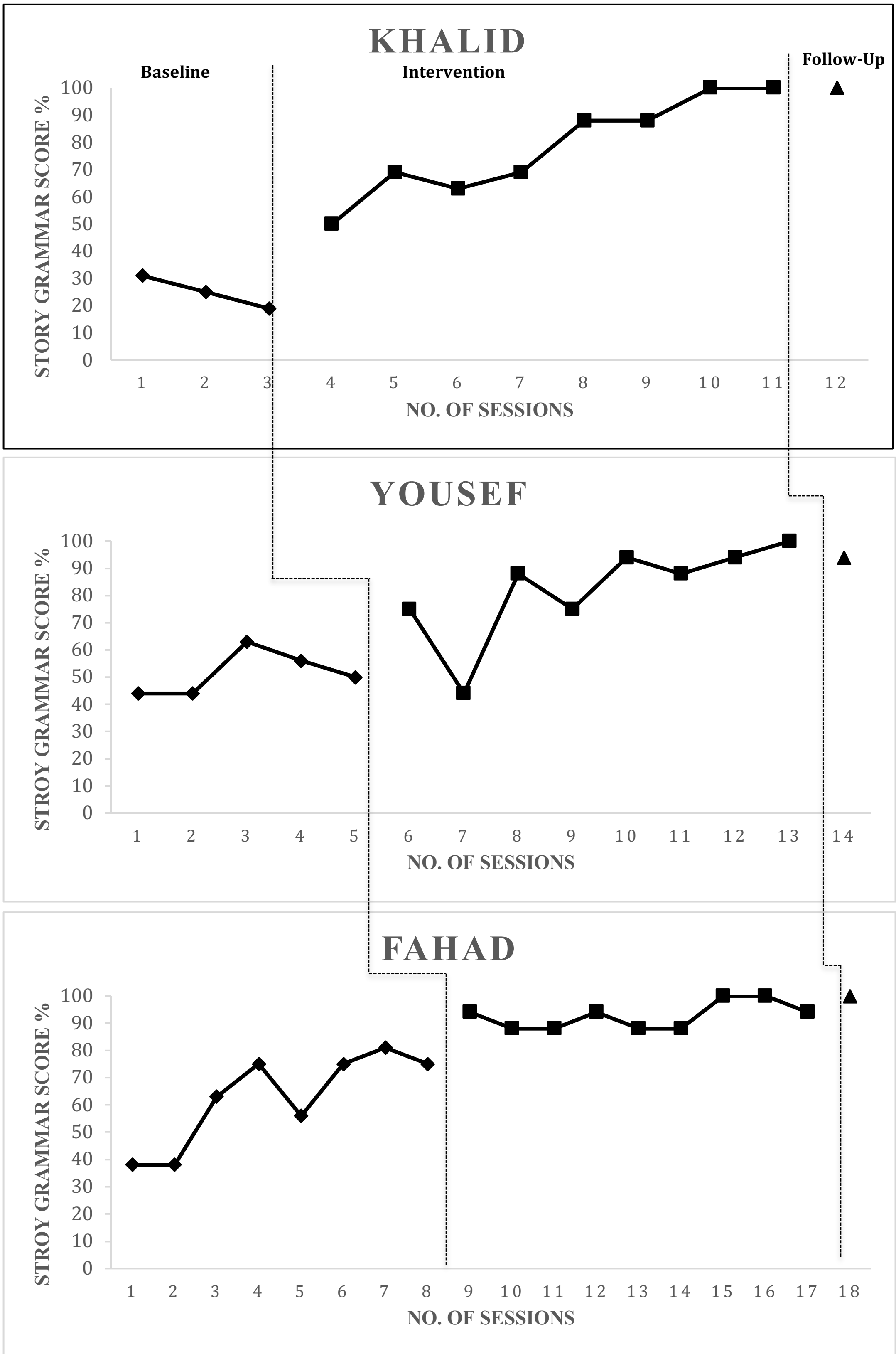
5.2.1 Visual Analysis

The performance of all three participants is unique to each child with one performing significantly better than the other two in the baseline phase of the narrative generation task (Figure 5.2). However, once in the intervention phase, all three children improved in their ability to generate a narrative and maintained the progress in the 2-week follow-up. Below is a detailed description of how each child performed in this task.

Khalid performed increasingly worse during his three-session baseline average of 25%. However, he continuously improved during the intervention phase as can be seen by the steady incline in his graph. He scored 100% in his final treatment session and 100% in the 2-week follow-up session, a gain of 75%.

Figure 5.2

Story grammar progress in generation task for all three participants



Yousef had a steady baseline phase with his numbers ranging from 44% to 63%. His performance fluctuated in the first three sessions of the intervention and then increased steadily towards the final session with a score of 100%. He maintained his high score in the 2-week follow-up at 94%, a gain of 43%.

Fahad made the most impressive increase in the baseline phase starting at 38% and scoring 75% on the final 8th baseline session, an average score of 63%. His graph displays a steady rise in the baseline that falls slightly in the first three sessions of the intervention and steadies off to a final score of 94%. In his 2-week follow-up session, he scored 100%, a gain of 37%.

5.2.2 Statistical Analysis

As with story grammar results in the retell section, both PEM and the 2-SD band method are in agreement with the significant improvement all three participants have made on this task (Table 5.4). The C-statistic on the other hand, finds that only Khalid and Fahad made a significant change, whilst Yousef did not. Within the 2-SD band, Khalid had 8 consecutive data points above the 2-SD band range, Yousef had 7 consecutive data points above the 2-SD band range and Fahad had 3 consecutive data points above the 2-SD band range.

Table 5.4

Story grammar statistical analysis in generation task for all three participants

	PEM	2-SD Band	C-Stat
Khalid	1	100	0.88
Yousef	0.9	88	0.45
Fahad	1	33	0.75

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = at least 2 consecutive data points are above 2-SD range = significant change, Blue = no 2 consecutive data points are above 2-SD range = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.3 EMOTIONS

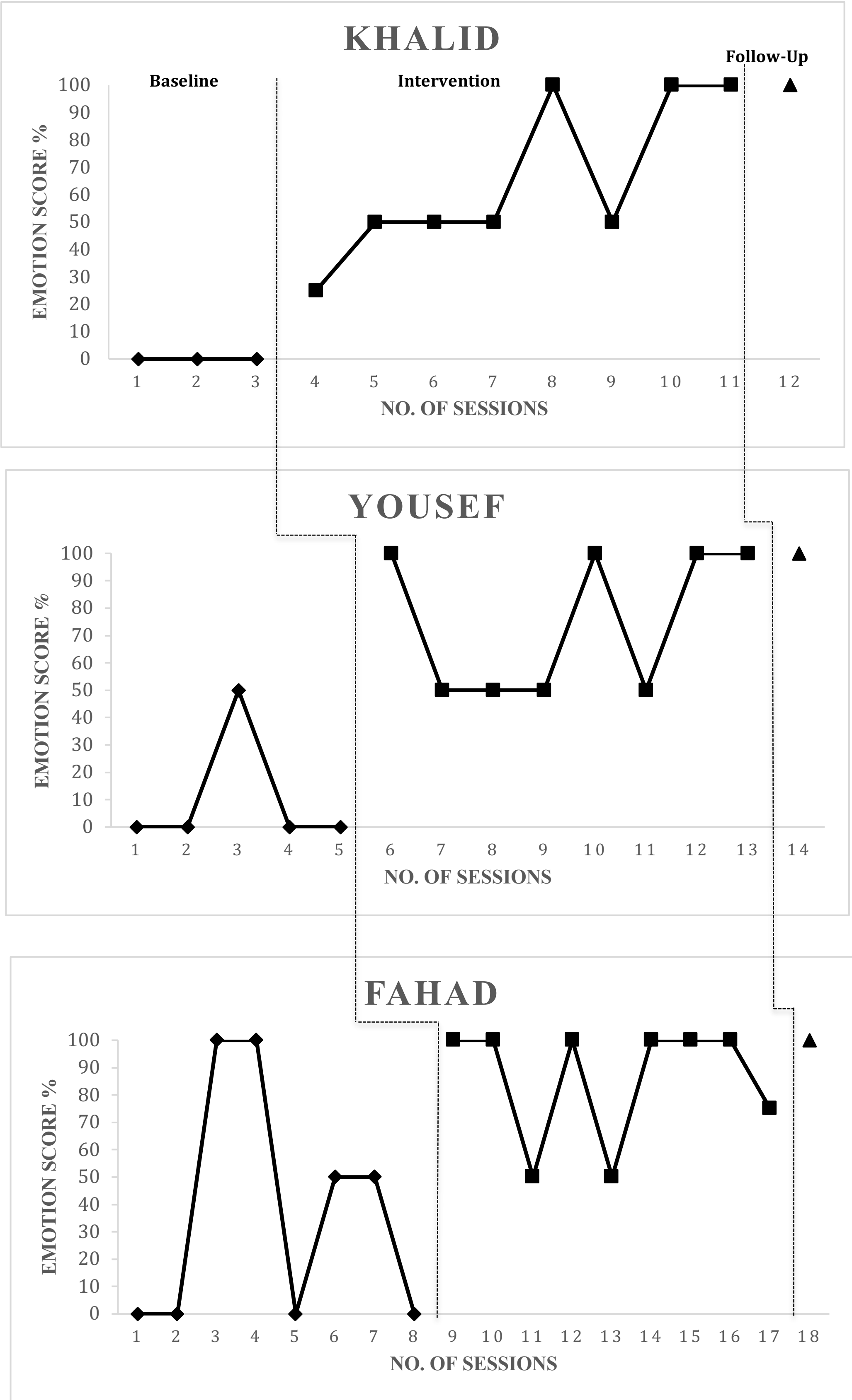
The following section provides a more insightful analysis of the results of the intervention by documenting the participants' abilities to relate emotions within the generation task. Emotion recognition is the ability to construe emotional facial, vocal or postural expressions about other's mental states to predict their behavior and is a fundamental element of social cognition (Adolphs, 2009). It is important to highlight the progress on the use of emotion words, as the study was designed to determine whether improving narrative relating skills would improve performance on social cognitive tasks of theory of mind. Within story grammar, a total of 4 points are given when emotions of characters are related, 2 points for when an emotion is described when a problem is first encountered, and 2 points for when an emotion is described when the problem is resolved.

5.3.1 Visual Analysis

During the baseline phase, it is clear that the participants were struggling with this task; 2 scored 0% while one child performed slightly better. The intervention phase shows that they all continued to struggle with learning this new target as can be seen from the zigzag lines in their graphs (Figure 5.3). Despite the inconsistencies, they all managed to discuss emotions correctly in their 2-week follow-up session by all scoring 100%. Following is a breakdown of the performance for each child.

Figure 5.3

Emotions progress in generation task for all three participants



Khalid visibly struggled with the use of emotion words as he performed at floor level scoring 0% in each of his three baseline sessions. An improvement can be seen in the intervention phase as he begins to implement the required behavior leading him to 100% accuracy in the 2-week follow-up session, a gain of 100%.

Yousef also performed at floor level scoring 0% in 4 of his 5 baseline sessions, with an average of 10% in this phase. In the intervention phase he starts off strong and drops to 50% accuracy and his performance continues to fluctuate towards the end of the intervention before stabilizing at 100% accuracy in the last 2 treatment sessions. He also manages to maintain this score in the 2-week follow-up session, a gain of 90%.

Fahad similarly displayed an inconsistency in his performance where he would alternate between scoring at floor and ceiling levels in the baseline phase, but with the highest average of 38%. This pattern of behavior continued into the intervention phase, and in the 2-week follow-up session, he scored at ceiling level with 100% accuracy, a gain of 62%.

5.3.2 Statistical Analysis

The PEM and the 2-SD band method find that the changes the participants have presented are significant (Table 5.5). Within the 2-SD band, Khalid had 8 consecutive data points above the 2-SD band range, Yousef had 4 consecutive data points above the 2-SD band range and Fahad had 6 consecutive data points above the 2-SD band range. The C-stat indicates that the changes all the participants have shown are not significant.

Table 5.5

Emotions statistical analysis in generation task for all three participants

	PEM	2SD	C-Stat
Khalid	1	100	0.64
Yousef	1	50	0.38
Fahad	1	67	0.18

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = at least 2 consecutive data points are above 2-SD range = significant change, Blue = no 2 consecutive data points are above 2-SD range = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.4 LANGUAGE COMPLEXITY

The following section details further results of the intervention by exploring the participants' use of language complexity components. Each boy received tailored targets of 2-3 components with the intention of providing a more unified narrative flow.

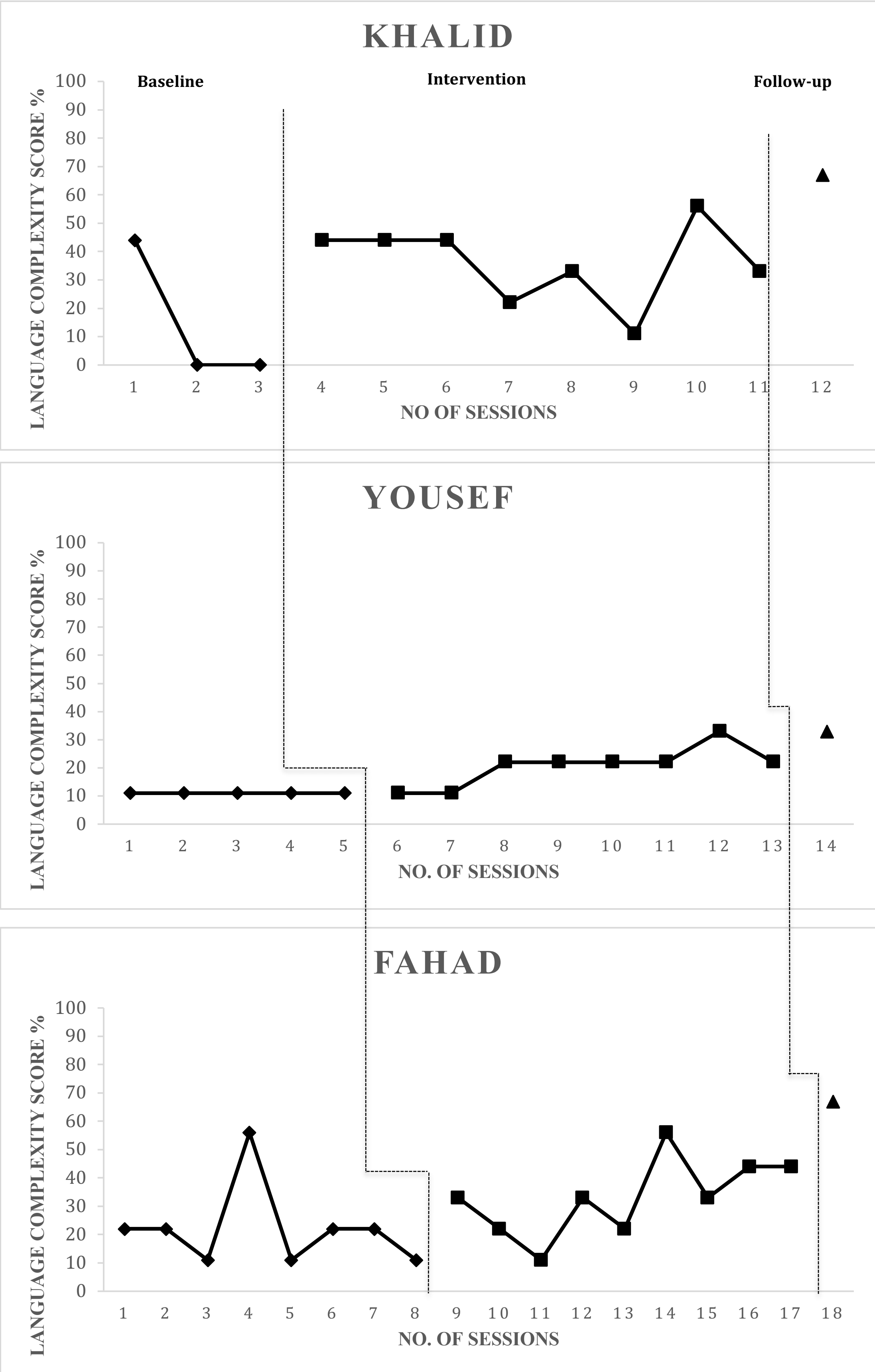
5.4.1 Visual Analysis

The participants all struggled in the baseline phase with many fluctuations (Figure 5.4). This fluctuation continues in the intervention phase, however, a steady improvement is seen from the slant in the lines below. They all appeared to have maintained the gains they made in their 2-week follow up sessions.

Khalid had a low baseline average scoring 0 on two of his three sessions, with an average score of 15%. In the intervention an improvement is seen and his performance peaks in the seventh session with a score of 56%. His gain of 52% is maintained in the 2-week follow up session with a final score of 67%.

Figure 5.4

Language complexity progress in generation task for all three participants



Yousef was consistent in his baseline performance scoring 11% in all 5 sessions. In the intervention phase, he makes a slight improvement peaking in his 7th session at 33%. This slight improvement is maintained in the 2-week follow up session with a score of 33%, improving his performance by 22%.

Fahad's performance fluctuated in the baseline phase with a high of 56% and a low of 11%; his baseline average was 22%. The intervention phase sees him continue his pattern of fluctuation where he scores 44% in his last two sessions. He maintains an improvement with a score of 67% in his follow-up session, an improvement of 45% in his performance.

5.4.2 Statistical Analysis

According to the PEM and 2-SD tests (Table 5.6), all three participants made highly effective and significant improvements in their use of language complexity components. The PEM value for Fahad however, indicates that his improvement on this task was questionable. Within the 2-SD band, Khalid had 4 consecutive data points above the 2-SD band range, Yousef had 6 consecutive data points above the 2-SD band range and Fahad had 3 consecutive data points above the 2-SD band range. The C-stat indicates that no significant effect was made on language complexity.

Table 5.6

Language Complexity statistical analysis in generation task

	PEM	2SD (%)	C-Stat
Khalid	1	50	0.4
Yousef	0.8	75	0.5
Fahad	0.7	33	0.1

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = at least 2 consecutive data points are above 2-SD range = significant change, Blue = no 2 consecutive data points are above 2-SD range = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

PART B

5.5 READING THE MIND IN THE EYES – CHILD

5.5.1 Visual Analysis

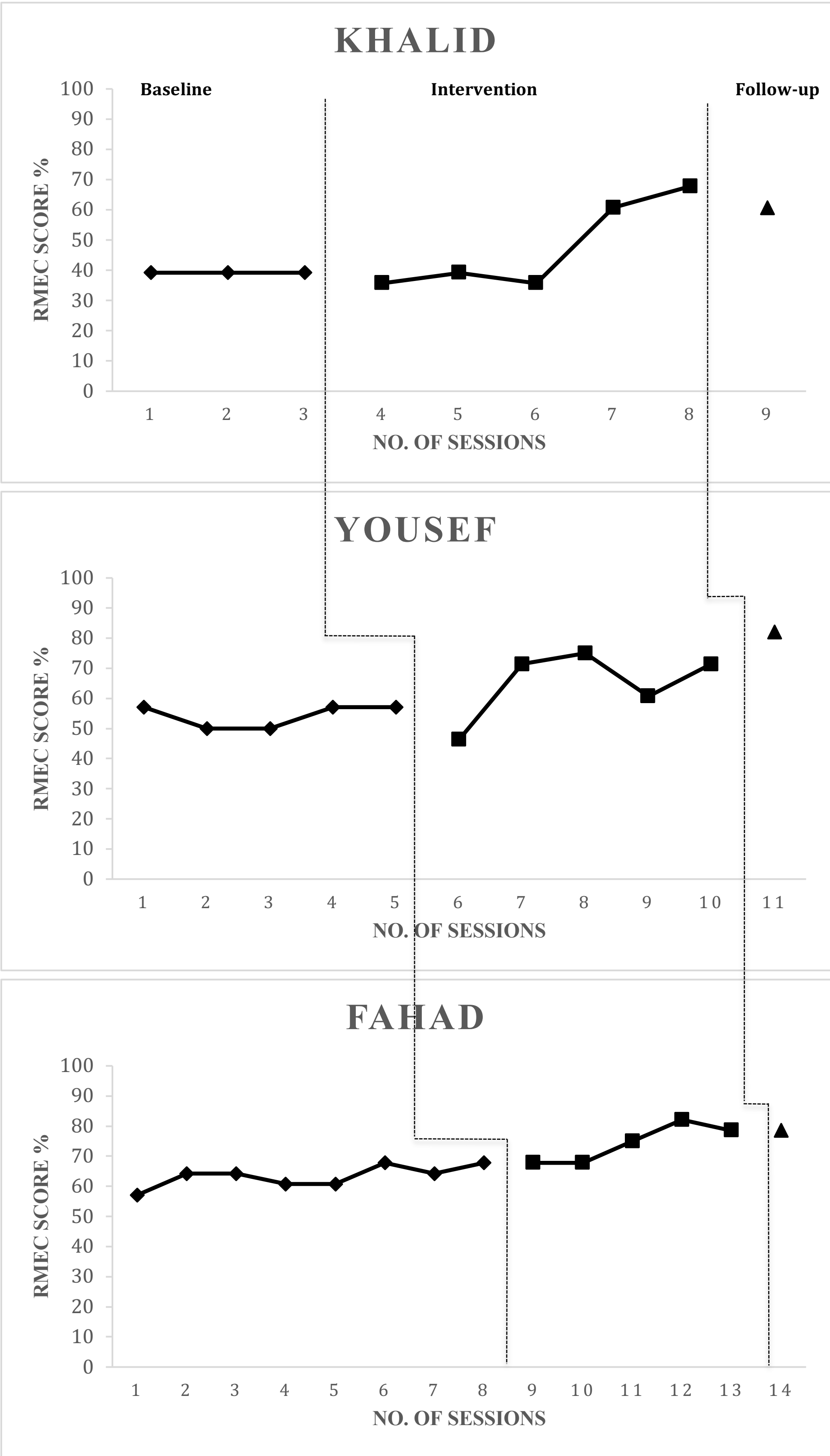
All three participants had a consistency in their performance across their respective baseline sessions regardless of how many correct answers each one gave (Figure 5.5). There is a variance in their performance during intervention, as one seems to make minimal improvements whilst the other two make visible progress, which is maintained in the 2-week follow up. The next session details the progress made for each participant on the Eyes test.

Khalid's baseline average was 39.2% on the RMEC, a value considered to be below chance, and this steadily increased after the third treatment session by 21.2% where his 2-week follow up score was 60.7% (Figure 5.5). During the first two baseline sessions, Khalid was very impatient in the performance of this task; he would mention that this is work that had already been done before and expressed exasperation at the repeated measure. During these two sessions, he had been given control over the booklet in turning the pages, as he proceeded to go through the pages quickly without taking the time to really consider the images. The role was reversed in the third baseline session and the examiner held the booklet, turning the pages for him while instructing him to look at the image on each page and pointing at all the 4 options to choose from.

Yousef started off with a baseline average of 54.3%, at the start of intervention he displayed a sharp rise in improvement during the first three treatment sessions, and only a gradual increase in the final three sessions. His performance improved by 29% with a 2-week follow up score of

Figure 5.5

RMEC progress for all three participants



82.1%; the highest of all three participants. He made a concentrated effort to take his time looking at the images before deciding on an emotion. He was also the most concerned about whether he was getting the correct answers or not on this particular task. This may account for his higher score, as he seemed determined to outperform himself.

Fahad started off with a baseline average of 63.3%, the highest amongst his peers, yet he made the least gains of 15.2% with a final 2-week follow up score of 78.5%. Fahad seemed ambivalent towards this task; he was neither deeply engrossed by it nor was he frustrated at having to perform it repeatedly. ‘Making somebody do something’ is one of the answers that is an option on more than one image in the RMEC. Fahad appeared to have memorized it, as he would state this answer quickly without pausing to look at the image and move on to the following page.

5.5.2 Statistical Analysis

Compared to narratives, the statistical significance on the participant’s performance with the RMEC is less conclusive and consistent as a whole (Table 5.7). Khalid’s performance was found to have no observed or questionable effect with the PEM, whereas the 2-SD band and the C-Stat observed significantly effective changes. Yousef’s performance was deemed moderately effective and significant with the PEM and 2-SD band, respectively, whereas the C-stat considers any improvements as not significant. Fahad’s performance shows highly effective and significant treatment with the PEM and C-Stat, and no significant effect with the 2-SD band. With the 2-SD band, Khalid had 3 consecutive data points above the 2-SD band range, Yousef had 5 consecutive data points above the 2-SD band range and Fahad had 6 consecutive data points above the 2-SD band range.

Table 5.7

RMEC statistical analysis for all three participants

	PEM	2SD (%)	C-Stat
Khalid	0.4	50	0.7
Yousef	0.8	83	0.24
Fahad	1	100	0.79

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = at least 2 consecutive data points are above 2-SD range = significant change, Blue = no 2 consecutive data points are above 2-SD range = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.6 FAUX PAS TEST

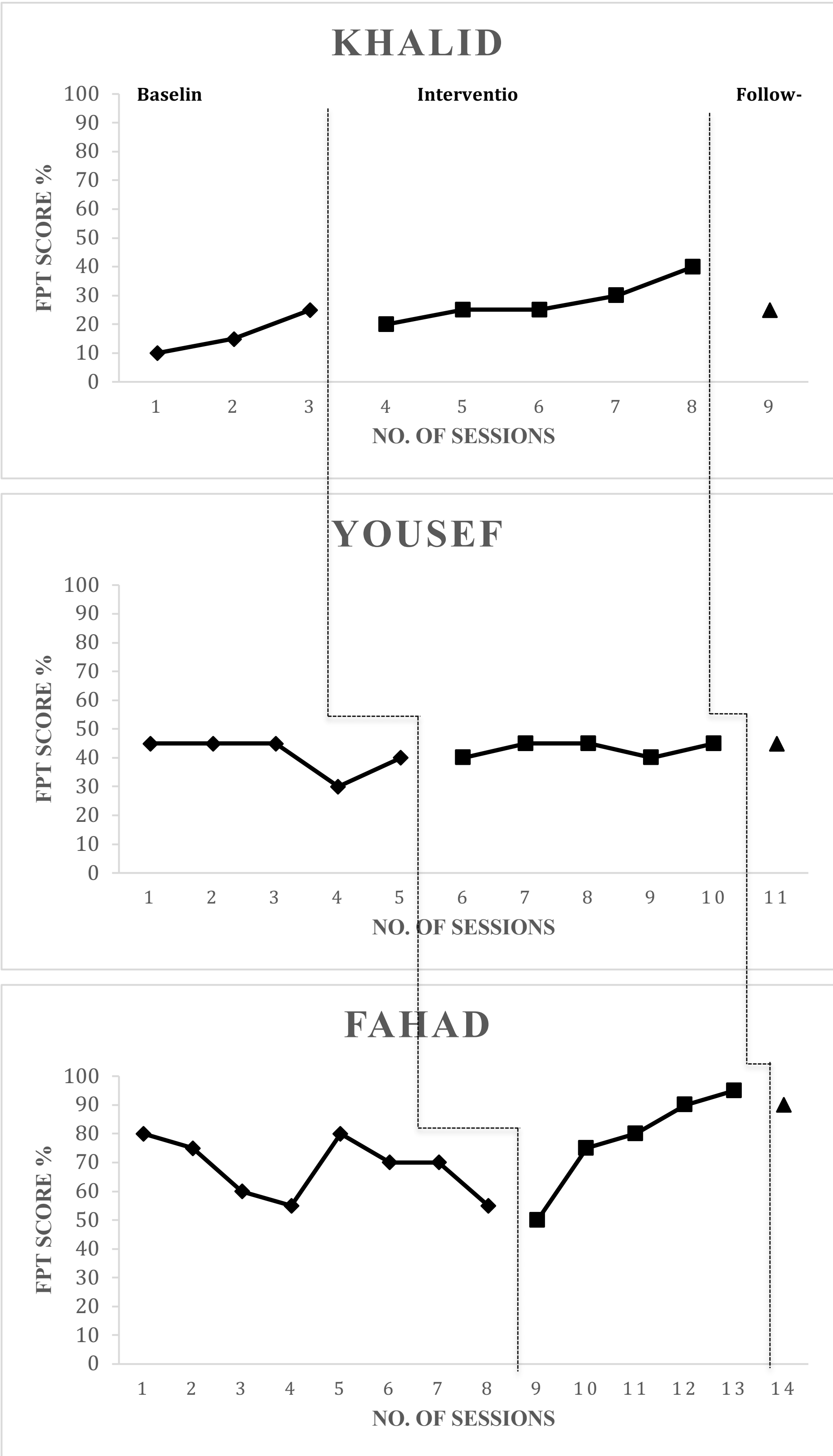
5.6.1 Visual Analysis

The baseline scores are largely varied with all three participants displaying a wide-ranging performance (Figure 5.6). With the cross over into the treatment phase, the monotonous pattern is maintained with a spike in performance towards the final two to three sessions of the intervention. This increase in performance drops slightly in the 2-week follow-up. The following sections provide details into the FPT performance for each of the three children.

Khalid started off with a baseline average of 16.7% and saw a very slight increase of 8.3% throughout treatment that was not maintained during the 2 weeks following treatment; he scored 40% on his final probe session, which dropped to 25% in his

Figure 5.6

FPT progress for all three participants



follow up session. His performance during this outcome measure seemed primarily guesswork.

Yousef had a baseline average of 41% and only improved by 4% towards his follow up session with a final score of 45%, as can be seen from the horizontal line on his graph. Similarly to Khalid, he appeared to quickly guess the answers than make an attempt to understand the story told and the questions asked.

Fahad appears to have a better understanding of the requirements of this task as his baseline average was 68.1% and he gained a 21.9% increase in accuracy towards his 2-week follow up session where his final score was 90%. It can be assumed from his scores that his comprehension skills and ability to detect faux pas are slightly superior to that of his peers. Though his baseline scores were a repeated decline and incline in performance, he did make steady improvement once treatment started.

5.6.2 Statistical Analysis

Khalid made the most improvement on this task with a statistically significant result from all three analyses. Yousef on the other hand had a statistically non-significant result on all three analyses. Fahad's performance is considered statistically significant on two of the three statistical analyses with the PEM indicating a moderate effect (Table 5.8). Within the 2-SD band, Khalid had 5 consecutive data points above the 2-SD band range, Yousef did not have any consecutive data points above the 2-SD band range and Fahad had 3 consecutive data points above the 2-SD band range.

Table 5.8

FPT statistical analyses for all three participants

	PEM	2SD (%)	C-Stat
Khalid	1	83	0.74
Yousef	0.6	0	0.05
Fahad	0.8	50	0.6

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = at least 2 consecutive data points are above 2-SD range = significant change, Blue = no 2 consecutive data points are above 2-SD range = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.7 DIFFERENCES IN STATISTICAL ANALYSES

To allow a clearer image to emerge for the overall statistical results of significance, a table showing the rate of agreement on significance between the PEM, 2-SD band and the C-Stat tests has been created for each participant and each of the three tests administered (Table 5.9). Though using different statistical analyses may result in different outcomes due to the varying methodology in calculations, there is strength in numbers which will enhance the overall results. As can be seen below, for all three participants, the three statistical tests are in agreement towards significant improvement on narrative generation. The results are varied for both the RMEC and FPT tests. On the RMEC, each participant made statistically significant improvement on 2 of three tests. Khalid made significant improvement according to the 2-SD band method and the C-stat; Yousef made significant improvement according to the PEM and 2-SD band method; and Fahad made significant improvement according to the PEM, the 2-SD band and the C-Stat. The overall results for the FPT is also varied; Khalid made a significant improvement according to both the PEM, the 2-SD band and the C-Stat. Fahad made a significant improvement according to the PEM and the 2-SD band method. Yousef was found to have made no significant improvement on the FPT by all three statistical analyses.

Table 5.9

Rate of significance for each participant and statistical analysis test

	Generation			RMEC			FPT		
	PEM	2-SD	C-Stat	PEM	2-SD	C-Stat	PEM	2-SD	C-Stat
K									
Y									
F									

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic. RMEC = Reading the Mind in the Eyes Test, FPT = Faux Pas Test,
K = Khalid, Y = Yousef, F = Fahad Green = significant (high and/or moderate effectiveness), blue = non-significant (questionable effectiveness)

PART C

5.8 ANXIETY

5.8.1 Spence Children's Anxiety Scale – Parent

Parents were asked to fill out the SCAS-P pre and post intervention. Table 5.10 below provides the overall and subscale T-scores of the participants. According to the SCAS website, a minimum T-score of 60 indicates subclinical or elevated levels of anxiety. Pre intervention, Khalid has elevated scores on social phobia (60), panic agoraphobia (61), and physical injury fears (> 70), however his overall T-score was 58 placing him within the normal range. His subscale scores post intervention were reduced to normal range on social phobia (56) and panic agoraphobia (59), yet his physical injury fears remain elevated (> 70). The overall T-score for SCAS was also reduced to 55.

Yousef had elevated scores for OCD (61), panic agoraphobia (61), physical injury fears (69), and generalised anxiety (61) pre intervention. His overall T-score is also 59 placing him in the normal range for anxiety. Following intervention, his panic agoraphobia, physical injury fears and generalised anxiety T-scores dropped to 59, 68 and 58, respectively while his OCD (61) T-score stayed the same. His overall T-Score dropped to 57.

Fahad had elevated pre intervention T-scores on the following subscales: social phobia (60), panic agoraphobia (62), separation anxiety (61), physical injury fears (69), and an overall T-score of 61 indicating elevated anxiety. In post intervention only his subscale T-scores on panic agoraphobia remained elevated at 62 and physical injury fears, though reduced, remained elevated at 65. Social phobia and separation anxiety both reduced to a normal range at 58 and 53 respectively. His overall T-score was reduced to normal range post intervention at 57.

Table 5.10

Pre and Post Intervention SCAS T-scores for All Participants

	OCD	SP	PA	SA	PIF	GA	Total SCAS-P	Percentile (%)
Khalid								
Pre T-score	55	**60**	**61**	42	**> 70**	51	58	80%
Post T-score	50	56	59	42	**> 70**	45	55	70%
Yousef								
Pre T-score	**61**	53	**61**	52	**69**	**61**	59	82%
Post T-score	**61**	50	59	49	**68**	58	57	77%
Fahad								
Pre T-score	59	**60**	**62**	**61**	**69**	53	**61**	86%
Post T-score	59	58	**62**	53	**65**	< 40	57	77%

OCD = obsessive compulsive disorder, SP = social phobia, PA = Panic Agoraphobia, SA = separation anxiety, PIF = physical injury fears, GA = generalised anxiety, Pre T-score = pre intervention T-score, post T-score = post intervention T-score, SCAS = Spence children's anxiety scale – Parent, > = greater than, < = less than
Numbers in bold indicate elevated levels of anxiety

5.8.2 McNemar Test

To determine the significance of the changes that have occurred between pre and post-test analysis on the SCAS, a McNemar analysis was conducted for all three participants. To be able to use the McNemar test, a series of assumptions must be met which are discussed next.

Assumptions

Initial exploration of the data showed that the assumptions were met.

1. The variable ‘anxiety symptoms’ fulfill the assumption of a categorical dependent variable with two dichotomous variables of ‘change’ ‘no change’.

2. The three ASD participants fulfill the assumption of a categorical independent variable with two related groups indicating a pretest-posttest design.

3. The two groups of the dependent variable must be mutually exclusive which is the case with the three ASD participants, as they are either in the ‘change’ or ‘no change’ category in both pretest and posttest settings.

4. The participants have been randomly sampled from the ASD population.

Four codes were created to reflect any changes that may have occurred during the intervention, with pre-intervention values coded as ‘anxious’ or ‘not anxious’ and post-intervention values coded as ‘change’ or ‘no-change’ to fit the 2x2 model of the McNemar, i.e. an item that was scored ‘2’ before intervention and also scored ‘2’ post intervention would be in the category ‘anxious x no-change’; an item that scored ‘2’ post intervention and was scored ‘1’ post intervention would be in the category ‘anxious x change’. Table 5.11 presents the frequency coding system for Khalid. It is important to note that none of the participants had an increase in change post intervention, i.e., all the changes were values that decreased from pre-intervention to post-intervention.

Table 5.11

Khalid Frequency Coding for McNemar Analysis

Khalid	**Post-Intervention**	
Pre-Intervention	**Change**	**No change**
Anxious	5	6
Not Anxious	0	27

The test determined that there was a statistically significant difference in parent-reported anxiety pre- and post-intervention for only Yousef and Fahad, $p = 0.04$ and $p = 0.02$, respectively (Table 5.12).

Table 5.12

McNemar Results for All Participants

	Khalid	**Yousef**	**Fahad**
Chi-square	3.2	4.2	5.1
Critical Value	3.84	3.8	3.8
P-value*	0.07	0.04	0.02

* Significant at the 0.05 probability level.

5.9 DISCUSSION

The purpose of this study was to evaluate the effectiveness of a narrative intervention in improving social cognition and indirectly reducing anxiety. The use of social cognitive probes helped determine whether an improvement in narrative language would improve theory of mind skills. To do so a rigorous, multiple-baseline, across participant's, single-subject, experimental design (SSD) was implemented on 3 boys with high-functioning autism. The results indicate that narrative language performance for all 3 participants improved post narrative intervention. Significant improvement was seen post-intervention for all three participants on the social cognition task RMEC, and for 2 of the 3 participants on the FPT. The parent-reported anxiety was lower on the SCAS-P following intervention. Anxiety was also significantly reduced post intervention for two participants and marginally significant for one participant as assessed by the SCAS-P.

5.9.1 Reflections on Narrative Performance

As children enter the school age, a greater emphasis is placed on the production, writing, reading and use of narrative language (Paul, 1995). It is even recommended that for school-age children with language impairments, language intervention should be directly targeted through narratives (Gillam & Ukrainetz, 2006). Multiple studies have supported the use of narrative intervention as a modality to improve language impairments. These are often presented in a functional format designed to generalise taught skills (Petersen, Gillam & Gillam, 2008; Davies, Shanks & Davies, 2004; Peña et al., 2006). All 3 participants' overall performance in this current intervention saw a significant improvement on the narrative generation task. This may be attributed to the rigorous study design of the intervention where key narrative elements were taught and multiple opportunities were created to practice them in a short time frame, as well as the use of a narrative intervention; a well-established, evidence-based approach to treatment.

This link between improved language skills following narrative intervention has been previously established. A systematic review by Petersen (2011) indicates that narrative-based language interventions targeting outcome measures of macrostructure (story grammar elements and episodic complexity) and microstructure elements (causal and temporal subordinating conjunctions, coordinating conjunctions, adverbs, elaborated noun phrases, cognitive and linguistic verbs, dialogue, length, total number of words, number of C-units, complexity, and MLU) may significantly improve the language performance of preschool and school-age children (Petersen, 2011). This extends to children with autism where three separate studies report marked improvements on individualised language targets that include mental state, causal language, as well as specific targets of *where, who with, what* and *feelings* within personal and spontaneous narrative production following narrative intervention programmes (Petersen et al., 2014; Gillam, Hartzheim, Studenka, Simonsmeier, & Gillam, 2015; Favot, Carter, & Stephenson, 2019).

Story Grammar

As a result of the intervention, all three participants had increased their use of story grammar features, narrating more complete episodes and ultimately, more coherent stories. Khalid is the eldest of the three participants (one year older than Yousef and 4 years older than Fahad), yet his language and cognitive skills were lower than his peers as evidenced by his CELF and IQ scores prior to intervention (See Chapter 4, Table 4.1, page 3). That being said, Khalid was the one who made the greatest gains of 75% than both Yousef and Fahad (whose performance on SG elements increased by 43% and 37%, respectively) to the point where all three children were at a similar level on SG performance in the 2-week follow-up. This may be because the language level Khalid started off with was not reflective of his chronological age and the intervention helped improve this skill to the point where he performed as well as his peers, and was able to successfully include his individual goals for SG elements (setting, plan/attempt, emotions and story ending). Yousef's language skills were slightly better than Khalids and less than Fahads', and this was reflected in his story grammar baseline. Yousef also benefited significantly from the intervention; however, his follow-up story did not have a complete 'problem' element to it and this is why he did not achieve a full score. Interestingly, 'problem' was not an individually targeted goal for Yousef (plan/attempt, emotions and story endings were), however, he was consistent in that his other stories would also sometimes have incomplete problems stated. Fahad already started off with the strongest language skills and he also had the most number of baseline sessions. This may have allowed him to pick up on the narrative structure intuitively as he made spontaneous improvements prior to the start of intervention. Once treatment sessions began, Fahad primarily needed to improve on the elements of emotions, as his individual targets of setting and story endings had shown marked improvement.

The intervention procedure involved hierarchical levels of narrative task complexity with decreasing levels of scaffolded support. A set of model stories was used to retell and generate narratives. The highly structured process guided the children in first listening to model stories and then eliciting highly supported retells, independent retells, highly supported generations, and ending with their own independent generation. Structural scaffolding was provided by way of a visual support system of pictures and story grammar icons as well as prompts, cues, and corrections. These procedures are not uncommon and have been used extensively in previous narrative interventions (Petersen, et al., 2014; Petersen, Gillam, Spencer, & Gillam, 2010, Spencer & Slocum, 2010; Favot, Carter & Stephenson, 2019). The repetitive nature of the intervention design facilitated the focus on story grammar elements where these targets were emphasized in each intervention session for 5 steps out of the 8 used in the narrative procedure.

This rigorous manner in highlighting story grammar elements combined with the systematic reduction in reliance on clinician and visual support, most likely explains the increased use of the above-mentioned target elements by the participants.

Linguistic Complexity

Linguistic complexity limitations are not uncommon, as difficulties in causally and temporally connecting story grammar elements have been previously recorded in individuals with autism (Diehl, Bennetto, & Young, 2006; Tager-Flusberg & Sullivan, 1995). Khalid lacked the basic causal and temporal markers of *because* and *when*. Yousef needed help in using *because*, *when* and *after*. Fahad was already using *then* and *because* consistently and accurately in his narratives and so was given the targets of *when* and *after* to increase his linguistic complexity elements. Once again, the overall statistically significant results for the participants corroborate the success of the intervention method and are similar to other studies that have targeted linguistic complexity using narrative intervention.

Emotions

One of the story grammar elements of higher significance to this study is that of emotions. The occasions in which emotion words were used by the participants' pre intervention were almost nonexistent when generating a narrative. It is worth noting that each story provided an opportunity to use two emotion words; at the start of the story following the reveal of a problem indicating how the character feels about said problem, and at the end of the story once the problem is solved. In the intervention procedure they were given multiple chances to practice their targets in the retell segment before the personal generation was elicited and coded. By the

2-week follow-up sessions, all the participants were relating two emotions for both the retell and generation tasks, which is further indication that the repetitive, frequent design of this intervention was effective in delivering the targeted goals.

5.9.2 Reflections on Social Cognitive Performance

A significant correlation has been documented between narrative measures and theory of mind in people with autism (Slade & Ruffman, 2005; Rakhlin et al. 2011). Two tests of social cognition, the RMEC and FPT, were administered five times as probes during the intervention to record any development in theory of mind skills that may have been generalised by the narrative intervention. Anxiety levels, pre and post intervention, were recorded by the parents of each boy using the SCAS in an attempt to explore the relations between narrative language, theory of mind skills and social-emotional functioning, and whether improving narrative language may indirectly affect anxiety.

RMEC

The participants in this study had a combined average score of 52.3% on the RMEC during the baseline phase, yet following narrative intervention; they had a combined average score of 74% at the 2-week follow-up. Previous research has shown that 27, 10-year-old children with ASD who require low support achieve an average score of 49% on the RMEC (Vogindroukas, Chelas, & Petridis, 2014). This stark difference between the post-intervention score in this study and previous research may be attributed to the differences in age and sample size of the participants, yet just as equally it may be attributed to the narrative intervention itself as the improvements seen in the RMEC coincide with the improvements seen in the narrative generation production of all three participants.

Overall, the performance on the RMEC was improved post intervention, with two of the three statistical analyses indicating a significant improvement for each participant. When viewed more closely, Khalid, who has the highest vocabulary test score of the three, made more improvement than Fahad who has the lowest vocabulary test score. This falls in line with previous research indicating a strong correlation between the RMEC and vocabulary (Olderbak, et al., 2015; Golan, Baron-Cohen, Hill & Golan, 2006; Ahmed & Miller, 2011; Peterson & Miller, 2012), i.e. the performance on the RMEC may be strongly founded on vocabulary strength. Yousef, on the other hand made the most improvement overall on this task despite having a lower vocabulary score than Khalid. This could be due to how carefully he approached the task, taking his time to consider all answers before making a choice while Khalid, as mentioned previously, appeared to always be in a hurry to finish, more concerned about what was going on with his classmates than what he was doing in the intervention session itself.

The RMEC has a moderate to strong correlation to emotion perception (Olderbak, et al., 2015; Henry, et al., 2009; Petroni, et al., 2011) and has been used previously to measure this behavior (Guastella et al., 2010). However, cultural factors may influence how a person 'reads' the emotions the images are portraying despite the universality of emotions. This effect is even more pronounced with complex facial stimuli (Elfenbein, Mandal, Ambady, Harizuka, & Kumar, 2002). In a study conducted by Adams et al., (2009) mental state decoding within two distinct cultures was examined using fMRI. White American and Asian eyes stimuli were used, and it was found that both Japanese and white American participants performed better when the eyes they rated were from their respective cultures. It could be that having to read Caucasian eyes as opposed to Arab ones may have affected the accuracy of the participants in this current study (Back, Ropar, & Mitchell, 2007). Additionally, there is the case of being required to socially analyse facial expressions through the asocial nature of printouts. This median that is static, and presented in black and white does not provide a real-life reflection of the dynamic and colorful range of expressions people are exposed to. The disparity in differences may have further affected their performance.

It has been argued that due to the correlations found between the RMEC, emotion perception and vocabulary, the RMEC is not only measuring ToM but also emotion perception and vocabulary; two variables that people on the autism spectrum generally have a deficit in (Harms et al, 2010; Bosseler & Massaro, 2003). Thus, the participants' performance in this study on the RMEC does not necessarily indicate a pure deficiency in ToM skills, but also poor emotion processing and vocabulary skills. This may indicate that by improving narrative skills, RMEC performance will also improve.

FPT

Previous research has shown that 15, 13-year-old children with ASD who require low support achieved an average score of 66% on the FPT (Baron-Cohen, O'Riordan, Stone, Jones, and Plaisted, 1999). The participants in this study had a lower average baseline score of 42% prior to intervention that increased to 58% at the end of intervention. Research has also shown that children with autism have difficulty answering questions that require inferences to be made about a story, even if they are able to answer factual questions about it, which in essence is what the FPT is asking them to do (Norbury & Bishop, 2002; Young, Diehl, Morris, Hyman, Bennetto, 2005). To effectively comprehend the story grammar within a narrative, a cognitive organization, recognized as a story schema, is required (Stein & Glenn, 1979). When compared against TD peers, language-disordered children are less effective in using story grammar components and episode units in narrative production, as well as having little comprehension in causally linking the story parts together. These factors indicate a cognitive-based deficit seen in both narrative retell and generation (Merritt & Liles, 1987). Furthermore, the ability to understand themes in stories, make inferences that are not provided in verbatim and form a concept of the gist of a story within the spectra of narratives can all be influenced by concept formation (Diehl, Bennetto, & Young, 2006). These factors brought together may provide a basis of explanation to how the participants in this study approached the FPT task. The participants learned how to relate a coherent personal story while focusing on language complexity and including descriptions on emotions, yet this does not necessarily mean they will become better at inferring mental states of others. The narrative intervention was successful in improving the targeted narrative skills, yet this improvement did not translate fully to the FPT. Furthermore, though the participants in this study fall within and above (in the case of Khalid) the age range the FPT targets (9-11 years), their performance suggests they did not all have the advanced theory of mind abilities needed to consistently identify the faux pas. Taking these numbers into consideration, it would have been prudent to test the participants' abilities to pass first- and second-order false belief tasks prior to administering the FPT. This could have been a prerequisite to participating in the study and should be factored into future research designs.

The FPT seemed to have been the most difficult task presented to all three participants as they struggled to make visible improvement. The results are also varied making it difficult to construct a general assumption on their performance. FPT scores were gradually increasing, albeit incrementally. These increases once again coincided with the improvements seen in the narrative generation skills of the participants following narrative intervention. That being said, statistically, only two participants made a significant improvement on two analyses, one of which was a moderate effect.

A strong association has been found between verbal mental age and false belief task performance in children with autism, where having a verbal mental age of 12 and above meant a participant was more likely to pass (Happé, 1995); i.e., the older a person becomes, the better their performance will be (Baron-Cohen et al., 1999). Khalid being the eldest of the three improved significantly according to two out of three statistical analyses, his vocabulary score was also the highest of the three. On the other hand, Fahad is the youngest participant with the lowest vocabulary score, yet he also improved significantly according to two out of three statistical analyses. This may be due to his higher language and IQ scores, compared to his peers. This indicates that poor verbal skills do not explicitly imply poor FPT performance. Furthermore, the correlation is at a group level and does not necessarily reflect individual skills. Though Yousef had a higher CELF score than Khalid, he failed to make any significant changes on this task.

5.9.3 Reflections on SCAS – P Anxiety Symptoms

The significant decrease in the overall SCAS-P scores post intervention may be attributed to the significant improvement in the narrative generations of the participants, i.e., an improvement in narrative skills may account for participants being better able to express their needs and feelings thereby reducing anxiety. It is worth noting that the particular use of the SCAS-P in a test-retest format is not common within a single subject multiple baseline design. However, one report does highlight that the SCAS-P has satisfactory 2-week and 3-month retest stability (Arendt, Hougaard, & Thastum, 2014).

Very little research exists on using narrative intervention explicitly to reduce and treat anxiety. Looyeh, Kamali, Ghasemi, and Tonawanik (2014) applied group narrative therapy on a group of 24 boys aged 10 – 11 diagnosed with social phobia. 12 boys received narrative intervention, and the remaining 12 were placed in the control group. Following a 7-week narrative program, there was a significant reduction on symptoms of social phobia in the treatment group both at home and in school. Another study that compared narrative and clay therapy on the anxiety of pre-school children found that children who received either clay or narrative therapy both had improved self-esteem, school performance, and sociability of the children involved compared to the third group of children who were controls and showed no reduction in anxiety (Rahmani, & Moheb (2010). The results of this current study fall in line with the above two that indicate narrative therapy may be a successful tool in treating anxiety. However, the results do need to be interpreted with caution as there may have been other outside elements that could have influenced the reduction in SCAS-P scores such as parent knowledge that their child is receiving treatment. That being said, parents were not notified of the possible link between the narrative intervention and reducing anxiety symptoms, nor were they aware of the specific details of intervention beyond it targeting narrative skills.

5.9.4 Reflections on The Current Study

This study provides preliminary evidence of a narrative intervention that can be effective in improving language skills, aspects of social cognition and tentatively reduce parent-reported anxiety in their children with autism. The design method used can be easily adapted to clinical settings, as well as in schools while the procedure is suitable for both group interventions as well as individualised programmes. The highly structured, multiple baseline process provided maximum guidance for the participants to understand and implement the targeted skills. Furthermore, the nature of providing decreasing levels of scaffolded support allowed participants to gain confidence in the process, ultimately producing narratives that flowed cohesively. Though the intervention focused on improving the generation of personal narratives, the approach can be applied to other discourse type such as generating a fictional story and tasks of writing narratives. It is also promising that in the short time frame of the intervention, narrative skills were maintained as well as improvements on theory of mind measures. The maintenance of these acquired skills provides support for academic and social skills. That being said, the research on the link between treating narrative skills and reducing anxiety to date is miniscule at best and the results presented here necessitate further exploration.

One of the dilemmas in designing this study was deciding what language to conduct the intervention in. Kuwait is a bilingual country with Arabic in a Kuwaiti dialect being the main language spoken and English being the unofficial second language. Though the participants are all Kuwaiti, they attended a Bilingual private school where the taught language of education is in English. Arabic is used only in Arabic lessons and Islamic Studies lessons. Furthermore, the bilingual questionnaires that parents filled out for the participants indicated that each child was exposed to English even at home with immediate and extended family members. These factors served as the basis for conducting the intervention in English. However, upon the completion of the intervention, two of the participants made it clear that they were much more comfortable and confident when speaking in Arabic than in English. Also, the dual exposure to Arabic and English at home and at school does not necessarily reflect the receptive and expressive language levels of the participants. Having a standardised Arabic language test to compare against would have been beneficial. Furthermore, performance on the social cognitive tasks of FPT and RMEC may improve if presented in a language participants are more comfortable in. Another factor in conducting the study in English was the lack of both language and social cognitive tests in Kuwaiti Arabic. Groundwork needs to be laid down that accurately embodies the TD population in Kuwait particularly as there are tests available that assess language of Saudi Arabian and Jordanian children, yet these would not reflect the colloquial language used by Kuwaiti people. This would allow a stable foundation in which to compare people with autism against.

Practice effects are influences on test results when a test is taken more than once. Though the design of this study is based on repetition, practice effect is minimal due to the following reasons: First, the narratives that the participants practiced on to produce individual generations were different in each phase and in each session with different characters and storylines; second, though the stories within the FPT were repeated every probe session, the order in which they were presented were always random, i.e., the stories were shuffled and placed face down for the participant to choose from one at a time. In terms of the RMET, the nature in which it is designed did not allow for a way to reduce any possible practice effects. It may be that repeatedly practicing the RMET improved their performance, however, as participants were not informed of the result for each item on the RMET they have no way of knowing if their answer was correct or not, also reducing practice effect.

The statistically significant reduction in anxiety is promising yet it cannot be explicitly stated that this is a result of improved social cognition, mediated through a successful narrative intervention. The start of intervention also happened to be the start of final year examinations for the participants, and the time of the follow-up assessment coincided with the end of the school year and the end of examination period. The subsequent decrease in anxiety may be attributed to these external factors. Anxiety may also have reduced towards the end of the intervention as participants had built up a friendly rapport with the examiner. Additionally, there is a possibility of information bias affecting the SCAS-P results, as parents were aware that in between the two SCAS-P forms, their children were receiving narrative treatment which may have inclined them towards perceiving a reduction in anxiety where one did not exist.

5.10 Limitations and Future Research

Though the NLM: P provided a very comprehensive and well-designed procedure for application and interpretation, it could have been supplemented with more relatable, culturally appropriate images that would aid task comprehension. This had been the initial plan yet time constraints prevented the implementation. Time constraints also proved to be a hindrance in following through with a more thoroughly designed process.

The NLM: P was being used to administer, record, and score the narratives of the participants. It comes with a manual detailing the best way to select a grade level to start the benchmark phase and subsequent progress monitoring for each participant. It recommended that the NLM reading task be administered first followed by the comprehension task and finally the listening task (Petersen & Spencer, 2016). As permission to work with the participants came only two months before the end of the school year and the start of final exams, this did not allow enough time to go through this procedure and though all participants received their own targets based on baseline performance, they were not given the opportunity to determine their unique grade levels. It would also have been of interest to conduct a 4-week follow up that would shed light on how effective the intervention could be. Delayed outcome measures provide details on the strength of the design study and how well it may generalise into the participants' everyday life. Such information allows a better argument towards standardizing and implementing this intervention in clinical settings.

The results of the FPT present with two possible suppositions; gains in a narrative intervention simply do not generalise onto improvements in social cognition within this task or they highlight the need for an alternative test of social cognition for this design method. The stories may have been too complicated for the participants to understand, affecting their performance. Not having visual support for each story as was done for the NLM: P may have further hindered their understanding of the material and affected their responses. These possibilities need to be further explored in future studies. The RMEC on the other hand did not require the participants to repeatedly make sense of a new story in a short period of time and the results on this task are promising. Though it would be interesting to explore whether performance would differ on images of eyes taken of people within the same region as the participants. Future research should also include within the criteria of eligibility, the participants ability to pass first- and second-order false belief tasks prior to the start of intervention before subjecting them to advanced ToM tests.

Multiple studies have used tests similar to the RMEC to measure emotion perception in children, adolescents and adults with autism. Participants are asked to label emotions seen through pictured faces, facially expressive cartoons, video clips or audiotaped tones of voice. The empirical evidence to date is conflicted with some studies showing the autism population to be deficit in their abilities to recognize emotions (Davies, Bishop, Manstead, & Tantam, 1994; Hobson, 1986; Doody & Bull, 2013; Philip et al., 2010), whilst others have show no difference from typically developing peers (Ozonoff, Pennington, & Rogers, 1990; Prior, Dahlstrom, & Squires, 1990). These results are disputable in part due to contradictory results between static versus dynamic stimuli (Klin, Jones, Schultz, Volkmar & Cohen, 2002). These inconsistent findings give rise to questioning the methodology that is being repeatedly used to measure emotion perception. Children with autism have long been known to have poor eye contact (Kaner, 1943), spend less time looking at faces compared to TD peers (Pelphrey et al., 2002; Tang et al., 2015), and are impaired in face recognition (Blair, Frith, Smith, Abell, & Ciplotti, 2002). This leads to the theory that performance on these tests may be a reflection of facial stimulus processing deficits and not an inability to detect and interpret emotions (Peterson, Slaughter, Brownell, 2015). Should this be the case, it would be prudent of future research to consider alternative methods that measure the processing of emotions in people with autism to better document their capabilities.

This study should be replicated again and include a larger population sample as well as TD participants as a basis of comparison. Including a control group will reduce the effects of a regression to the mean, a statistical phenomenon common in repeated data designs, where unusually large or small values are usually followed by values closer to the mean, and may be the cause of an observed change (Barnett, van der Pols & Dobson (2005). The effects of a longer language intervention targeting comprehension skills should also be considered as they may prove to be more beneficial in generalizing effects onto social cognitive tasks that require more intact comprehension skills. Additionally, as the link between narratives and anxiety were the main focus, more opportunities should be provided for the participants to practice using emotion words in their narratives as opposed to the 2 emotion words per story in this intervention. It also recommended that future studies repeat the study in the participants' main spoken language, which may lead to a difference in the FPT results. Finally, as the participants were a very specific subgroup within autism spectrum disorders, the results can only be generalised to this particular group only. To provide a deeper understanding of the complexities of this disorder, the studies reported here should be replicated with other subgroups of autism.

5.11 CONCLUSION

The findings of this intervention indicate that upon improving the story grammar of narrative skills in children with ASD, a subsequent improvement on social cognitive tasks was seen, that may have mediated the reduction of anxiety symptoms. The results of this intervention are promising however, results do need to be interpreted with caution considering the small number of participants recruited. There may also be clinical implications in these findings, yet further investigations are warranted before any firm conclusions can be made.

CHAPTER 6

The Final Discussion

6. INTRODUCTION

Autism spectrum disorder is a life-long developmental disorder with core impairments in socials skills, repetitive behaviors with restricted interests and communication (DSM-5, 2013). Within the scope of autism, there is a continued need to further understand the nature of this disorder considering it's heterogeneous nature and how it substantially affects the individuals who are diagnosed with it and their family members, as well as the service providers who strive to provide effective, evidence-based treatment options (Ganz, 2007; Leigh & Du, 2015). Individuals with ASD are known to present with language delays and psychiatric, cognitive and motor disorders that hamper their ability to develop typically (Stone & Yoder, 2001; Mannion, & Leader, 2016; Matson, & Shoemaker, 2009).

Many theories have sought to explain autism symptoms; the most researched are Theory of Mind (ToM), Executive Function (EF) and Weak Central Coherence (WCC). The ToM hypothesis describes social impairment in autism as the inability to attribute mental states to the self or to others negatively impacting social cognitive development, which leads to poor social skills development, eventually complicating social situations for individuals (Baron-Cohen et al., 1986; Baron-Cohen, 2001). Within the ASD population, deficiencies in EF result in poor organizational skills and attention and poor planning which are all needed for an individual to express the temporal and causal sequences of events (Pellicano, 2012). These deficits also affect social competence, adaptive behavior, and academic achievements (Rajendran & Mitchell, 2007;

Robinson, Goddard, Dritschel, Wisely, & Howlin, 2009). The WCC theory highlights the local processing bias in people with autism, often resulting in detailed narrative accounts that are not combined to form an appropriate representation of the information (Frith and Happé, 1994). As neither one of these theories can explain the core symptoms of ASD, a multiple-deficit account of autism was suggested where each theory can be used to explain an aspect of autism (Joseph, Tager-Flusberg, & Lord, 2002).

Language delay is the primary reason of referral in children with ASD (Stone & Yoder, 2001). A defining feature of ASD is pragmatic language difficulties, which involves the ability to appropriately use language within a social context while accounting for the knowledge and interests of the listener (Diehl, Bennetto, & Young, 2006). These difficulties may increase social misunderstandings and reduce successful communication resulting in negative social interactions. Additionally, the linguistic features of pragmatics facilitate communication through the use of language (de Villiers, 2004). This involves the communication of intent, inferencing the amount of knowledge a listener has, and regulating discourse that includes among other things, oral narratives (Stockman, Karasinski, & Guillory, 2008; Atlas, 2004).

Intact narrative language skills are an important foundation for academic and social success and have been extensively used in the assessment and treatment of language (Norbury, Gemmel & Paul, 2013). They require the simultaneous use of linguistic, cognitive and social-cognitive abilities (Bamberg & Damrad-Fyre, 1991), allowing individuals to analyse their own experiences and relationships and aid in conveying these experiences to others in an attempt to form successful interactions. The narrative production and comprehension skills in individuals with autism has been extensively documented with a pattern emerging of narratives that are deficient in overall story structure, with a tendency towards adding irrelevant information, poor use of pronouns, limited or unconventional vocabulary and use of fewer causal references resulting in narratives that are less coherent to the TD population (Losh & Capps, 2003; Rapin & Dunn, 2003; Lake, Humphreys, & Cardy, 2011; Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008). Results on the use of Internal state language, words that are used to refer to the perceptions, thoughts and feelings in others, have been varied with findings suggesting a deficit in this area in people with autism and others suggesting they are intact (Siller, Swanson, Serlin, & Teachworth, 2013; Norbury & Bishop, 2003).

It is believed that there is a link between language disorders and anxiety, as children and youth with a language impairment report higher levels of anxiety and are diagnosed with anxiety disorders more frequently than TD peers (Maggio et al. 2014). Two potential pathways may exist; poor narrative skills affect a person's ability to interact with each other which results in social awkwardness and isolation that leads to anxiety, or poor narrative skills affect a person's ability to make sense of their own thoughts and emotions, preventing them from coherently expressing themselves that leads to anxiety (Snow, Burns & Griffin, 1998; Russell & Safronoff, 2005). It is still unclear whether only one pathway or both pathways combined are prominent in manifesting anxiety in people with ASD.

A recent study on children with ASD who need low support found that children who score high on structural language skills but low on pragmatic language skills, experience more anxiety (Rodas, Eisenhower, & Blacher, 2017). This suggests that for children with ASD, having higher language skills means they are more aware of how they are dissimilar from their peers, feel isolated, with negative self-perceptions leading to awkward interactions and avoiding social situations, which may translate as anxiety (Petersen et al., 2014; Myles et al. 2001; Rodas et al., 2017). On the other hand, other research suggests that the core features of ASD that may include cognitive delays as well as communication deficits may affect an individual from understanding their emotions and conveying those emotions coherently to people around them that may lead to an increase in anxiety (White et al., 2011; Russell & Safronoff, 2005; Wood & Gadow, 2010). The research to date points towards the necessity of examining the possible links between anxiety within the context of narrative language more closely in individuals with ASD as these two areas have a significant bearing on the daily functioning of people with ASD. In the event that a link is established, this would provide a turning point for effective and targeted intervention sessions where narrative skills and anxiety can be treated simultaneously, reducing time for lengthy treatment programmes and cost of treatment services. To better understand the relationship between narrative language and anxiety, three main questions were asked:

1. How do the narratives of children with ASD differ from those of their typically developing peers?
2. Does narrative ability predict anxiety in ASD and TD children, when language and nonverbal IQ are controlled?
3. Does narrative intervention lead to improved narrative skills and social cognitive performance, and would this lead to a subsequent reduction in symptoms of anxiety?

6.1 SUMMARY OF METHODS AND RESULTS

Three studies were conducted to answer the above questions. The first study compared 19 ASD and 20 TD participants on narrative generation production as well as on language skills, nonverbal IQ, AQ traits, and levels of anxiety. Narratives were coded for story grammar elements, microstructure, deviation and evaluation devices. The results show that children with ASD use fewer story grammar elements, have more difficulty with referential accuracy and deviate more form the main story line by adding irrelevant information. The second study looked at the same groups of participants and evaluated whether specific narrative measures are correlated to parent-reported anxiety levels and whether these narrative measures may be used to predict anxiety. Findings indicate that collectively, children with higher autistic traits, who are younger in age, with a lower IQ present with higher parent-reported anxiety. From the perspective of language, having poorer language skills, poorer SG and RA scores, and increased deviation all indicate a child is more likely to experience anxiety. Findings also revealed that AQ, deviation and the interaction variable between AQ and deviation, are significant predictors of anxiety, explaining the variance seen in parent-reported anxiety. However, when AQ and deviation are considered individually, they are positively correlated to SCAS-P, i.e., the higher the AQ score or the more a person deviates from the narrative, the higher the SCAS-P score is. On the other hand, the interaction variable between AQ and deviation indicates that individuals with a high AQ score who also deviate more from the narrative experience less anxiety. The third and final study recruited 3 participants with ASD from the previous ASD group to participate in a narrative intervention. The aim of the study was to determine whether improving the production of story grammar via a narrative intervention, would result in an improvement of theory of mind skills and a reduction in anxiety symptoms. The intervention was successful in improving narrative generation performance for all three participants, including story grammar, linguistic complexity, and use of emotion words. Performance on social cognitive tasks also improved significantly, with a reduction in parent-reported anxiety post intervention.

6.2 DISCUSSION

The differences highlighted in narrative performance between the participating groups may be attributed to the specific core features of ASD as language was controlled for. Though none of the cognitive theories were measured, these findings may be explained by some of their features that are known to be reduced or deficit in the ASD population. For instance, the reduced ability to correctly and consistently refer to characters while narrating a story may be due to poor working memory and planning, which are skills of EF, as well as poor CC, as referencing is a multidimensional task that requires a narrator to keep track of previous context, while determining what the listener currently knows simultaneously as the story is progressing. The propensity to not include all story grammar elements may be a result of deficient organizational and attention skills of EF as well as poor CC as the ASD children appear to struggle more in putting the details of the story together to form a well-structured narrative. Additionally, their tendency to deviate from the narrative by adding irrelevant details or bizarre information may have also affected their ability to relate the necessary story grammar elements for a coherent narrative.

Successful pragmatic features require the narrator and the listener to be on mutual grounds when it comes to the message that is being expressed. If the narrator has difficulty in correctly referencing people and misses out crucial parts of the message they are delivering that reduce its coherence and also interjects it with details that are not relevant or with bizarre comments, then the listener will have difficulty in interpreting their message. Therefore, these deficits in the narrative performance of children with ASD most likely play a role in the pragmatic difficulties these children face. These reduced pragmatic skills make way for social misunderstandings with reduced or negative interactions with peers which may lead to self-negative thoughts and increased anxiety.

The findings here that link narrative ability to anxiety support recent findings that indicate children with lower pragmatic skills present with increased levels of anxiety (Rodas et al. 2017). As successful interactions require intact language and conversational skills to better deliver a message and share thoughts and feelings, then lacking the ability to do so may cause a person to avoid such situations making way for various anxiety disorders. The results of the regression that show AQ traits and deviation and the interaction between AQ and deviation may predict anxiety bolsters the relationship between these three areas. When considering the results of the AQ and deviation variables individually within the regression, it can be suggested that the core features of communication deficits within ASD may result in children being unable to coherently relate issues that are important to them. This may result in them trying to compensate their linguistic deficits by speaking more, adding more, yet unnecessary, information to the narrative. And ultimately, there may be a realization on their part that their message is not being delivered and met the way that they would like it to resulting in anxiety. This supports a causal pathway between language skills and anxiety where poor narration affects the ability of the person to successfully interact with others leading to increased anxiety. However, the interaction variable between AQ and deviation indicates that individuals with high AQ scores who deviate more from the narrative experience less anxiety. As this result is unexpected and may be due to variables that were not included in the analysis, additional studies are needed to explore this further.

An initial look at the results raises the obvious question as to how deviation can predict anxiety. When coding the narrative measure of deviation, the distinction was not made between the types of deviation that were present in the narratives of the ASD participants. One participant showed stereotypical behavior where one word 'onion' was repeatedly interjected throughout the entire narrative that had no relation to the story. More commonly, participants would fixate on a specific detail seemingly oblivious to more important aspects of the story that need to be narrated. There was also the case of the participant who added details to the narrative that reflect happenings in real life where he said the mother sitting on the bench was reading about the refugee crisis or the man having a picnic was from Palestine and his wife was from Syria. These aspects of deviation may affect how others perceive anxiety in children with ASD. In situations where a child is trying to narrate a story about themselves, which may include a discussion of their feelings and emotions, yet they deviate from what they should be saying in ways similar to the ones mentioned above, parents may then interpret this as anxiety.

The tentative relationship that is being established between autism, anxiety and narratives, is further strengthened by the results of the narrative intervention, where improved performance on social cognitive tasks coincided with the improvement of narrative language and the subsequent reduction in anxiety symptoms. The findings of the intervention lend support to the second causal pathway where narrative skills affect an individual's ability to make sense of their own thoughts and feelings leading to an increase in anxiety symptoms (Russell & Sofronoff, 2005). This link may be explained through the cognitive theories of autism. Recently, researchers have explored the link between neurocognitive functioning and anxiety where results indicate that anxiety levels predict impairments in executive function (Shields, Moons, Tewell, & Yonelinas, 2016). Others report that executive function, specifically the ability to shift cognitive sets, mediates fearful temperament which results in childhood anxiety (Affrunti, Woodruff-borden, 2015). Within autism, one study reports a significant association between poor executive functioning and higher levels of anxiety (Hollocks et al. 2014).

From the results provided by the studies conducted here, there is evidence supporting a multiple causal pathway towards anxiety in people with autism that is spearheaded by deficits in narrative language. That being said, it is likely that there are other various pathways to impairment and added cognitive factors that play a role in the relationship between autism, anxiety and narrative skills which should be explored further.

6.3 IMPLICATIONS

The intervention study design can be easily adapted and implemented in clinics and in schools, and the procedure itself allows for a tailored programme that suits each individual's needs. Implementing a design that directly targets language, and indirectly targets social cognition and anxiety is also cost-effective and time efficient for parents of children of need, and the centres that provide this service. Specifically, CBT programmes may make it a prerequisite to treat narrative deficits in children with ASD prior to starting CBT as this will aid children in better expressing their feelings and emotions resulting in a more successful outcome. This approach may also be used in other clinical and TD populations who have narrative and language deficits and elevated levels of anxiety. The maintenance of the participants' performance in the follow-up sessions is also indicative of the benefits this intervention will have on functional communication, social relationships and academic success (Petersen, Ukrainetz, & Spencer, 2014).

6.4 LIMITATIONS

There are several limitations to this thesis. First, the small sample size of the participants may have reduced power of the analyses. Second, more measures should have been used in making sure the participants are equally proficient in both Arabic and English languages as opposed to relying only on the bilingual questionnaire. Equally, parent proficiency in the English language should have been ascertained before sending out the AQ and SCAS-P questionnaires. Third, only one measure was used to assess anxiety symptoms from one informant casting doubt on the reliability of the results as employing multiple sources has been repeatedly called for. Fourth, participants should have been screened for their ability to pass first-order false belief tasks prior to administering the advanced tests within the narrative intervention. Fifth, it cannot be concluded that these deficits of narrative are unique to children with autism only as children with other developmental difficulties such as specific language impairment (SLI) or pragmatic language impairment (PLI) were not included in the analysis. Finally, as direct measures of the cognitive theories were not used, it can only be speculated as to how these results may explain the social-cognitive deficits seen within autism.

6.5 FUTURE RESEARCH

These studies should be conducted again but on a larger scale to increase the analytical power of the results with improved screening of both language and cognitive abilities. Multiple sources and informants for anxiety measures should be included, such as asking parents and clinicians to report on anxiety and to use diagnostic measures alongside questionnaires to strengthen the profile of anxiety that is emerging. Additionally, to provide a direct mapping onto cognitive theories, tests of EF, WCC and ToM should be included. Finally, the results of the narrative intervention are promising, yet different assessments of social cognition and a more robust study design should be followed in the future to further elaborate on the relationship between the explored variables. The intervention should also be replicated with a larger group of participants and should include a TD group as a point of comparison. A longer intervention period as well as multiple follow-up sessions will also help strengthen the findings.

6.6 CONCLUSION

These studies have served to explore the interconnected relationship between narrative skills and anxiety in children with ASD. From a general vantage point, children with ASD in Kuwait appear to experience narrative deficits and anxiety symptoms of a similar nature to previously published works from the international community. More importantly, this is the first time that specific narrative measures have been associated with symptoms of anxiety and the first time that narrative measures have been identified as being able to predict anxiety symptoms. This has serious implications towards how clinicians may approach the treatment of people with ASD within language and anxiety with far-reaching consequences on time and cost for individuals with ASD, their family members, and the service providers.

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APPENDIX A

CURRENT DSM-5 SEVERITY LEVELS FOR AUTISM SPECTRUM DISORDER

Current DSM-5 Severity Levels for Autism Spectrum Disorder

Severity Level	Social Communication	Restricted, repetitive behaviors
Level 1 Requires Support	Difficulty initiating social interactions, uncommon/unsuccessful responses to social overtures towards others. Possible decreased interest in social interactions	Inflexible behavior causes substantial interference with functioning in at least one context. Difficulty switching between activities. Independence reduced to organization and planning difficulties
Level 2 Requires substantial support	Social impairment is clear even with support. Noticeable deficits in verbal and nonverbal social communication skills. Limited initiation of social interactions with reduced or atypical responses to social advances from others	Inflexible behavior, difficulty coping with change, or other restricted/repetitive behaviors are consistent and evident to the casual observer and impede functioning in a variety of contexts
Level 3 Requires very substantial support	Severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others as a result of severe deficits in verbal and nonverbal social communication skills	Inflexible behavior, severe difficulty managing change, or other restricted/repetitive behaviors notably interfere with functioning in all domains. Great distress/difficulty in shifting attention or action.

APPENDIX B

CHAPTER 2 RESULTS FOR NARRATIVE RETELL

Results

The means, adjusted means, standard deviations and standard errors of all eight measures on the retell task for the ASD and TD groups are shown in table 1. The mean values in bold indicate that the value in this group is higher than that of the other group.

There was a statistically significant difference between ASD and TD groups on the combined dependent variables of the retell task after controlling for language and nonverbal IQ, $F(8, 26) = 3.264$, $p = .010$, Wilk's $\Lambda = .499$, partial $\eta^2 = .501$.

Table 1.
Means, Adjusted Means, Standard Deviations and Standard Errors for the Eight Narrative Measures for Each Diagnosis Group

	Diagnosis			
	TD (*n* = 20)		ASD (*n* = 19)	
Retell Narrative Measures	*M (SD)*	*M*adj *(SE)*	*M (SD)*	*M*adj *(SE)*
Story Grammar	**71.1 (4.7)***	**68.7 (3.3)***	**48 (14.7)***	**55.4 (3.2)***
Mean Length of C-Unit	**10.2 (1.4)***	**9.4 (.5)***	**7.5 (1.7)***	**7.5 (.5)***
Type Token Ratio	.33 (.02)	.34 (.01)	.34 (.05)	.37 (.01)
Number of Mazes	36.1 (18.1)	41.1 (9.5)	46.2 (35.2)	54.6 (9.2)
Referential Accuracy	**97.2 (4.3)***	**94.9 (3.4)***	**82.2 (13.6)***	**85.3 (3.3)***
Deviation	**.30 (.73*)**	**.32 (1.1)***	**5.3 (4.6)***	**3.9 (1.1)***
Total Evaluation Devices	18.1 (6.9)	16.8 (2.6)	17.3 (8.0)	17.3 (2.5)
Frames of Mind	10.5 (4.0)	9.4 (1.5)	9.2 (4.9)	9.7 (1.5)

* $p < .05$ indicating a significant difference between the ASD and TD group

There were statistically significant interaction effects between Diagnosis and language ($F(8, 26) = 2.684$, $p = .027$, Wilks' $\Lambda = .548$, partial $\eta^2 = .452$), indicating that language levels affect how participants perform on narrative tasks. No statistically significant interaction effects were found between Diagnosis and nonverbal IQ ($F(8, 26) = .841$, $p = .841$, Wilks' $\Lambda = .794$, partial $\eta^2 = .206$).

Follow up univariate one-way ANCOVAs were performed. A Bonferroni adjustment was made such that statistical significance was accepted at $p < .0625$.

Mean Length of C-Unit

There was a statistically significant difference in adjusted means for MLCU between the two groups ($F(1, 33) = 7.113$, $p = .012$, partial $\eta^2 = .177$). Mean and adjusted mean scores were higher in the TD group ($M = 10.2$, Madj = 9.4) than the ASD group ($M = 7.5$, Madj = 7.5), indicating that sentences produced by the TD group were significantly longer than those produced by the ASD group.

Type Token Ratio

A statistically significant difference was not found for TTR between the two groups ($F(1, 33) = 2.745$, $p = .107$, partial $\eta^2 = .077$). The mean and adjusted mean scores of the ASD group ($M = .34$, Madj = .37) were higher than the TD group ($M = .33$, Madj = .34), indicating the ASD group have higher lexical variety, yet the difference was not significant.

Mazes

A statistically significant difference was not found for the number of mazes between the two groups ($F(1, 33) = 1.055$, $p = .312$, partial $\eta^2 = .031$). On average, the ASD group produced more mazes ($M = 46.2$, Madj = 54.6) than the TD group ($M = 36.1$, Madj = 41.1), yet this difference was not significant.

Referential Accuracy

There was a statistically significant difference in adjusted means for referential accuracy between the two groups ($F(1, 33) = 4.173$, $p = .049$, partial $\eta^2 = .112$). Mean and adjusted mean values indicate the participants in the TD group ($M = 97.2$, Madj = 94.9) were more accurate in their use of references towards characters than the participants in the ASD group (M =82.2, Madj = 85.3).

Deviation

There was a statistically significant difference in adjusted means for deviation between the two groups ($F(1, 33) = 5.667$, $p = .023$, partial $\eta^2 = .147$). The ASD group ($M = 5.3$, Madj = 3.9) had significantly higher mean and adjusted mean values than the TD group ($M = .30$, Madj = .32). This indicates that the participants in the ASD group more often added details to their narratives that are not pertinent to the original story than the TD participants.

Total Evaluation Devices

A statistically significant difference was not found for the total evaluation devices between the two groups ($F(1, 33) = .015$, $p = .903$, partial $\eta^2 = .000$). The mean and adjusted mean values for the TD group ($M = 18.1$, Madj = 16.8) were higher than those for the ASD group (M =17.3, Madj = 17.3), indicating that the TD participants used more evaluation devices in their retell narratives than ASD participants.

Frames of Mind

A statistically significant difference was not found for frames of mind between the two groups ($F(1, 33) = .022$, $p = .883$, partial $\eta^2 = .001$). The TD group (M =10.5, Madj = 9.4) had a slightly higher mean and adjusted mean value than the ASD group (M = 9.2, Madj = 9.7), indicating that TD participants use more words to refer to a characters cognitive and emotional states of mind than the ASD participants.

Story Grammar

There was a statistically significant difference in adjusted means for story grammar between the two groups ($F(1, 33) =8.599$, $p = .006$, partial $\eta^2 = .207$). The participants in the TD group (M =71.1, Madj = 68.7) had higher mean and adjusted mean values than the ASD group (M = 48, Madj = 55.4) on the retell task. Therefore, the narratives of the TD participants contained significantly more story grammar elements than that of the ASD participants.

APPENDIX C

SAMPLE ASSESSMENT REPORT AS AN INCENTIVE FOR PARENTS TO ALLOW THEIR CHILDREN TO PARTICIPATE IN THE DATA COLLECTION PROCESS FOR CHAPTER 2

<u>Assessment Report</u>

Name:
Date:
Age at time of assessment:

This is a summary of the assessment findings administered on the (enter date) for (enter name) for the PhD research titled:

Anxiety in Relation to Narrative Deficits in Children with Autism Spectrum Disorders

(Child) was seen for assessment as part of the above PhD study where assessments were carried out focusing on narrative skills and anxiety levels.

Autism Diagnostic Observation Schedule - ADOS
The ADOS is a play-based assessment used to diagnose autism and autistic spectrum disorders.

Clinical Evaluation of Language (CELF)
The CELF is a comprehensive language assessment. For the purpose of the research only the core language of your child was evaluated. The core language is a measure of general language ability that quantifies the students' overall language performance and is used to make decisions about the presence or absence of a language disorder. It should be noted that the assessment was conducted in English and as this is not (child's) first language the results should be interpreted with caution.
The following table is a break down of the scoring (child) achieved in each subtest that makes up the core language

Subtest	Subtest task	Standard Score	Age equivalent
Concepts and Directions	(Receptive language)		
Recalling sentences	(Expressive language)		
Formulated sentences	(Expressive language)		
Word Class	(Receptive and expressive language)		
Word Definition	(Expressive language)		
	Overall core language score		

The subtests of the CELF are as follows:
Concepts and Directions assesses the child's ability to understand and carry out instructions of increasing complexity.
Recalling Sentences assesses the child's ability to recall sentences accurately as their grammatical structure gets increasingly complex.

Formulated Sentences assesses the child's ability to formulate simple and complex sentences.
Word Classes assesses the child's ability to understand different sorts of relationships between the meaning of words.
Word Definition assesses the child's ability to provide word meanings.

The results of this language test show that (child) strengths are (enter data here) and the areas they found more challenging were (enter data here).

Peabody Picture Vocabulary Test (PPVT)
The PPVT is an untimed test of receptive vocabulary intended to provide a quick estimate of verbal ability and scholastic aptitude. Your child received a score of (enter score here) which translates to an age equivalent of (enter age here).

Raven's Nonverbal IQ
The Raven's Progressive Matrices is an assessment of non-verbal ability. It is a 60-item test of multiple choice questions used to measure abstract reasoning. (Child's name) received a score of (enter score here). It is difficult to compare the score to norms as norms are not available for Kuwaiti children. However, age-equivalent scoring indicates that your childs' score places him at the (enter age) range.

Narrative retell and generation
(child's name) was given two wordless picture books and asked to retell the first story and independently generate the second story. The narratives were then analysed for five story grammar elements; these are the elements needed to create a story which include character, a problem the character faces, how the character feels about the problem, the attempt made to solve the problem and the consequence of those actions. Based on (child's name) narratives, s/he scored (enter score here) on the narrative retell and scored (enter score here) on narrative generation. These results indicate (enter interpretation of results here).

Thank you very much for allowing your child to participate in this study. All the data provided will go towards improving treatment and assessment protocols in Kuwait thereby improving the quality of life children with autism. If you have any concerns or questions regarding these test results please email me at the following address: Latifa_alajmi@live.com

Latifa Alajmi
PhD candidate
University of Reading

APPENDIX D

CHAPTER 2 PARENT INFORMATION SHEET

Project Title: Exploring the relationship between narrative skills and anxiety in children with ASD

Information Sheet

Supervisor:	Email:	Phone:
Dr. Tom Loucas	t.loucas@reading.ac.uk	0118 XXX XXXX
Dr. Fiona Knott	f.j.knott@reading.ac.uk	
Experimenter:		
Latifa Al Ajmi	latifa_alajmi@live.com	0096550501188

We would be grateful to you if you and your child could assist us by participating in our intervention study.

The intervention will focus on improving the personal narrative skills of your child in with the aim that the taught skills will improve the emotional literacy of your child thereby reducing any anxiety s/he experiences.

The intervention will be covered over 6 consecutive weeks, with three 45-minute sessions per week.

The intervention is broken down into three phases:

Pre-treatment: the baseline performance of your child will be collected on a battery of assessments that measure their personal and fictional narrative skills as well as their anxiety levels.

Treatment: This involves your child attending12 45-minute sessions, three times per week. Treatment will target personal narrative skills; the child's ability to narrate personal experiences of a story-like nature

Post- treatment: the assessments used in the pre-treatment phase will be administered again to allow for a measure of improvement, if any.

Your childs' data will be kept confidential and securely stored, with only an anonymous number identifying it. Information linking that number to your childs' name will be stored securely and separately from the data you provide us. All information collected for the project will be destroyed after a period of 5 years from the completion of the project. Taking part in this study is completely voluntary; you may withdraw at any time without having to give any reason. That being said, it is advised that to see the best results, a commitment to attend these sessions is made.. Please feel free to ask any questions that you may have about this study at any point.

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct

Thank you for your help.
Latifa Al Ajmi

APPENDIX E

PARENT CONSENT FORM

Title of Study: Exploring the relationship between anxiety and narrative skills in children with ASD

CONSENT FORM – Parent

I, ……………………………………… agree to participate in the above study being conducted by Latifa Al Ajmi at The University of Reading. I have seen and read a copy of the Participants Information Sheet and have been given the opportunity to ask questions about the study and these have been answered to my satisfaction. I understand that all personal information will remain confidential to the Investigator and arrangements for the storage and eventual disposal of any identifiable material have been made clear to me. I understand that participation in this study is voluntary and that I can withdraw at any time without having to give an explanation.

I am happy to proceed with my participation.

Signature --

Name (in capitals) --

Date --

APPENDIX F

CHILD INFORMATION SHEET

Project Title: Exploring the relationship between narrative skills and anxiety in children with Autism (pilot study)

Information Sheet

We would like you to take part in our study by answering a few questions and telling a story.

You will be asked to answer questions about how you feel and also you will be you given two books.

You can choose the book you like best and use the pictures inside to help you tell a story.

If you have any questions you should ask them.

If you want to stop, just say stop at any time and we shall stop.

Thank you

Latifa Al Ajmi

APPENDIX G

CHILD CONSENT FORM

Title of Study: Exploring the relationship between anxiety and narrative skills in children with ASD

CONSENT FORM – Child

1. I have read the information sheet and I understand what I have been asked to do

2. I was allowed to ask questions about the study and they have been answered

3. I understand that all the information about me will stay private

4. I understand that I do not have to take part in this study and if I want to stop I can do so at any time

Signature --

Name (in capitals) --

Date --

APPENDIX I

BILINGUAL QUESTIONNAIRE

Bilingual Questionnaire

Name of your child: ________________________________

Date of birth: _____________________________________

1. What languages does your child speak?

Arabic	English	Other (specify)

2. Which language do you think your child feels the most at home in? _________________________

3. Please mention to what degree your child is exposed to the following languages

	0 Never 0%	1 Rarely 25%	2 Sometimes 50%	3 Usually 75%	4 Always 100%
Arabic					
English					
Other (specify)					

	Score/4
Arabic	
English	
Other	

4. In what contexts does this exposure take place? (Check all appropriate cells.)

	Arabic	English	Other
a. Exchanges with mother			
b. Exchanges with father			
c. Exchanges with grand parents			
d. Exchanges with babysitter / child minder			
e. Exchanges with siblings			
f. Nursery / school / day care center / kindergarten			
Total *(1 point per cell)*			
Total by language	*/6 (or 7)*	*/6 (or 7)*	*/6 (or 7)*

APPENDIX L

CHAPTER 3 NARRATIVE RETELL CORRELATION AND REGRESSION

Table 1.

Spearman Correlation Between SCAS and Independent Variables for Both Groups

		SCAS	AQ	Age	IQ	CELF	MLCU	RA	SG
AQ	r_s	**-.475****							
	p	**.002**							
Age	r_s	**-.341***	-.040						
	p	**.034**	.809						
IQ	r_s	**-.334***	-.292	**.555****					
	p	**.038**	.071	**<.001**					
CELF	r_s	**-.490****	**-.677****	.294	**.656****				
	p	**.002**	**<.001**	.069	**<.001**				
MLCU	r_s	**-.418****	**-.343***	.283	**.535****	**.701****			
	p	**.008**	**.033**	.081	**<.001**	**<.001**			
RA	r_s	**-.363***	**-.382***	.264	**.525****	**.741****	**.719****		
	p	**.023**	**.016**	.105	**.001**	**<.001**	**<.001**		
SG	r_s	**-.291**	**-.539****	.260	**.509****	**.789****	**.798****	**.725****	
	p	**.073**	**<.001**	.109	**.001**	**<.001**	**<.001**	**<.001**	
Dev	r_s	**.340***	**.341***	-.101	**-.363***	**.574****	**-.373***	**-.398***	**-.480****
	p	**.034**	**.034**	.539	**.023**	**<.001**	**.019**	**.012**	**.002**

Table 2.

Spearman Correlation Between SCAS and Independent Variables for the ASD Group

		SCAS	AQ	Age	IQ	CELF	MLCU	RA	SG
AQ	r_s	.191							
	p	.434							
Age	r_s	-.177	.106						
	p	.469	.665						
IQ	r_s	-.060	.083	**.574***					
	p	.807	.734	**.010**					
CELF	r_s	-.121	-.412	.396	**.605****				
	p	.622	.080	.093	**.006**				
MLCU	r_s	-.219	.328	.418	**.501***	.072			
	p	.368	.170	.075	**.029**	.769			
RA	r_s	.019	.036	.231	.292	.342	**.466***		
	p	.937	.883	.342	.224	.152	**.044**		
SG	r_s	.220	-.136	.288	.330	.392	.431	**.581****	
	p	.364	.578	.233	.168	.097	.065	**.009**	
Dev	r_s	.062	-.020	-.100	-.209	-.388	.337	.096	.107
	p	.800	.936	.684	.390	.100	.158	.696	.662

Table 3.

Spearman Correlation Between SCAS and Independent Variables for the TD Group

		SCAS	AQ	Age	IQ	CELF	MLCU	RA	SG
AQ	r_s	**.490***							
	p	**.028**							
Age	r_s	**-.486***	-.373						
	p	**.030**	.105						
IQ	r_s	-.426	-.374	**.524***					
	p	.061	.105	**.018**					
CELF	r_s	-.410	-.440	**.457***	**.709****				
	p	.072	.052	**.043**	**<.001**				
MLCU	r_s	-.122	-.065	.361	.367	**.566****			
	p	.609	.784	.118	.112	**.009**			
RA	r_s	-.184	-.128	.442	**.459***	**.534***	**.453***		
	p	.437	.591	.051	**.042**	**.015**	**.045**		
SG	r_s	-.149	-.191	.388	.276	**.516***	**.706****	.319	
	p	.532	.420	.091	.238	**.020**	**.001**	.170	
Dev	r_s	.061	-.122	-.012	-.110	-.073	-.231	-.013	-.209
	p	.798	.609	.959	.644	.760	.327	.956	.376

Table 4.

Backward Regression Models Predicting SCAS From Age, AQ, IQ, CELF, RA Deviation, SG, AQ*RA, AQ*Dev., and AQ*SG

		ΔR^2	*B*	*SE b*	β	*p*-value
Step 1	(Constant)	.163	33.487	96.176		.731
	Age		-.600	.999	-.118	.553
	IQ		.321	.384	.222	.410
	Language		-.132	.115	-.444	.262
	AQ		-.104	1.376	-.192	.941
	MLCU		-5.741	4.497	-.964	.213
	RA		-1.179	1.326	-1.194	.382
	Deviation		5.228	4.126	1.748	.216
	SG		2.234	1.1.63	2.882	.066
	AQ*MLCU		.064	.071	1.060	.376
	AQ*RA		.016	.019	2.550	.418
	AQ*Deviation		-.073	.059	-1.840	.230
	AQ*SG		-.026	.016	-2.766	.115
Step 2	(Constant)	.194	26.373	17.558		.145
	Age		-.597	.979	-.117	.547
	IQ		.316	.370	.218	.401
	Language		-.132	.113	-.442	.254
	MLCU		-5.865	4.109	-.985	.165
	RA		-1.099	.775	-1.113	.168

	Deviation		5.428	3.108	1.814	.092
	SG		2.241	1.138	2.891	.059
	AQ*MLCU		.066	.060	1.105	.278
	AQ*RA		.015	.010	2.352	.158
	AQ*Deviation		-.076	.045	-1.912	.102
	AQ*SG		-.026	.015	-2.778	.105
Step 3	(Constant)	.212	21.695	15.614		.176
	IQ		.215	.327	.148	.517
	Language		-.130	.112	-.437	.254
	MLCU		-.5626	4.044	-.945	.175
	RA		-1.083	.766	-1.096	.168
	Deviation		5.854	2.994	1.957	.061
	SG		2.200	1.123	2.839	.060
	AQ*MLCU		.062	.059	1.024	.304
	AQ*RA		.015	.010	2.394	.146
	AQ*Deviation		-.082	.043	-2.067	.068
	AQ*SG		-.025	.015	-2.740	.105
Step 4	(Constant)	.227	23.766	15.142		.127
	Language		-.086	.089	-.290	.339
	MLCU		-5.221	3.958	-.877	.197
	RA		-1.010	.750	-1.022	.189
	Deviation		5.330	2.857	1.782	.072
	SG		2.028	1.081	2.617	.071
	AQ*MLCU		.055	.057	.911	.347
	AQ*RA		.014	.010	2.265	.161
	AQ*Deviation		-.074	.041	-1.862	.081
	AQ*SG		-.023	.015	-2.501	.124
Step 5	(Constant)	.230	24.338	15.108		.118
	CELF		-.088	.088	-.295	.329
	MLCU		-1.736	1.541	-.292	.269
	RA		-1.062	.747	-1.075	.165
	Deviation		5.180	2.849	1.732	.079
	SG		1.628	.996	2.101	.113
	AQ*RA		.015	.010	2.441	.128
	AQ*Deviation		-.070	.041	-1.759	.096
	AQ*SG		-.017	.013	-1.879	.201
Step 6	(Constant)	.230	20.423	14.582		.171
	MLCU		-2.237	1.456	-.376	.135
	RA		-1.040	.746	-1.053	.173
	Deviation		4.740	2.814	1.585	.102
	SG		1.493	.986	1.926	.140
	AQ*RA		.015	.010	2.384	.136
	AQ*Deviation		-.060	.039	-1.509	.138
	AQ*SG		-.016	.013	-1.762	.228
Step 7	(Constant)	.218	23.329	14.503		.118
	MLCU		-2.548	1.446	-.428	.087

	RA		-.173	.247	-.175	.489
	Deviation		3.234	2.553	1.081	.214
	SG		.311	.225	.402	.176
	AQ*RA		.003	.001	.481	.015
	AQ*Deviation		-.039	.036	-.973	.287
Step 8	(Constant)	.230	16.612	10.797		.113
	MLCU		-2.830	1.378	-.475	.048
	Deviation		3.099	2.526	1.036	.229
	SG		.230	.191	.296	.237
	AQ*RA		.003	.001	.437	.017
	AQ*Deviation		-.037	.035	-.921	.307
Step 9	(Constant)	.228	19.689	10.392		.067
	MLCU		-3.489	1.223	-.586	.007
	Deviation		.525	.465	.175	.267
	SG		.325	.167	.419	.061
	AQ*RA		.002	.001	.345	.028
Step 10	(Constant)	.222	22.909	10.031		.029
	MLCU		-3.517	1.228	-.591	.007
	SG		.283	.164	.365	.093
	AQ*RA		.002	.001	.373	.017

AQ = Autism Quotient, RA = Referential Accuracy, SG = Story Grammar, AQ*RA = interaction variable between AQ and RA, AQ*Deviation = interaction variable between AQ and Deviation, AQ*SG = interaction variable between AQ and SG.
* $p < .05$.

APPENDIX O

STORY GRAMMAR ICONS

Character
Setting
Problem
Feeling
Attempt
Consequence
Ending
End Feeling

APPENDIX P

CHAPTER 4 INTERVENTION RESULTS FOR NARRATIVE RETELL

Narrative Retell

Visual Analysis

During the baseline phase, narrative retell scores were fluctuating for all three children with a generally low scoring point (Figure 5.1). With the start of narrative intervention, a sudden increase in scoring is seen across all three participants, with a sudden drop around the third and fourth intervention sessions, seen by a rise towards the end of the treatment. Generally, all three boys maintained their higher scores in the 2-week follow up. The following section details a breakdown of the individual narrative retell performances for each participant.

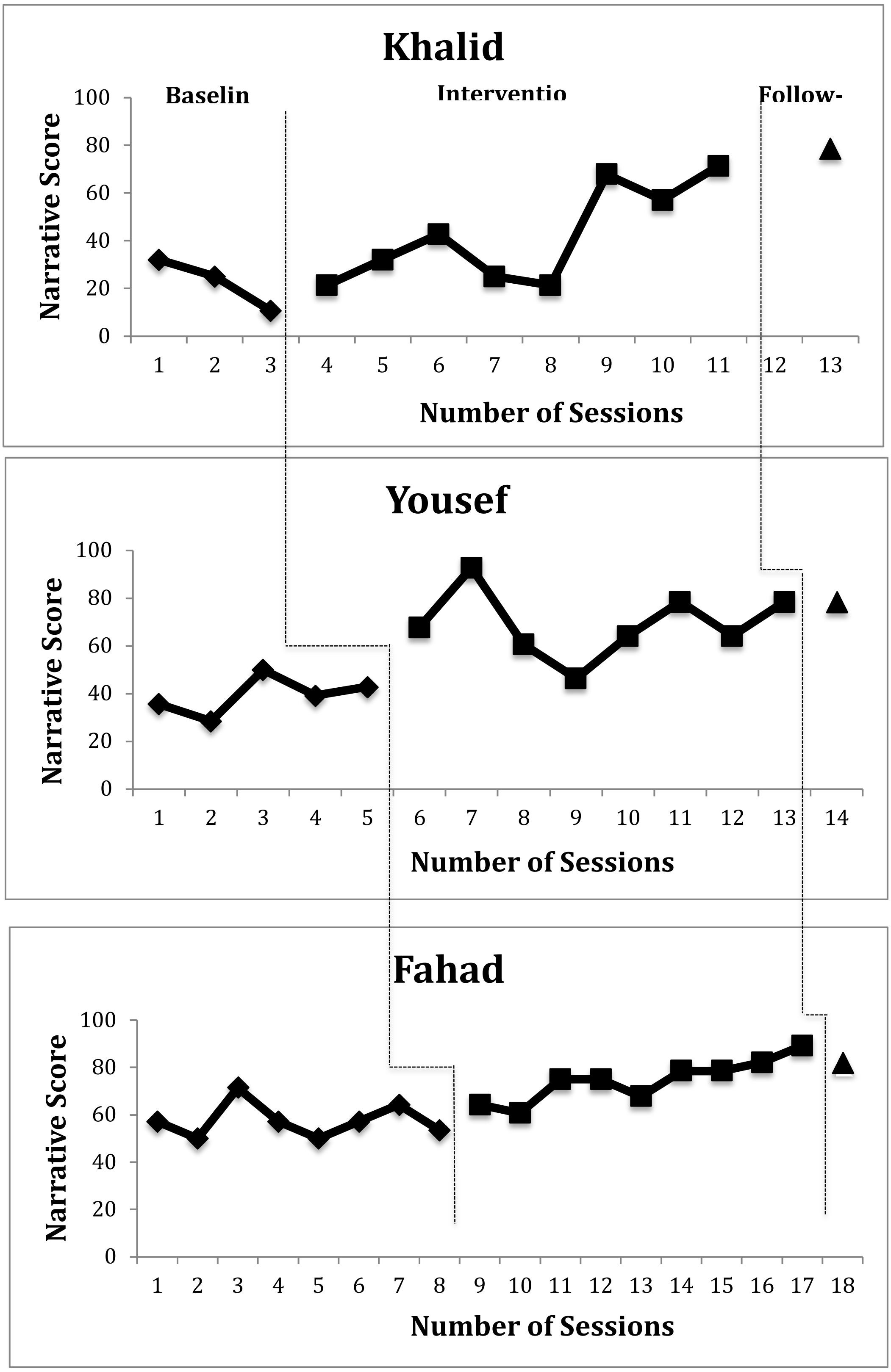
Khalid appeared to have struggled the most with the retell task, as his average baseline score was the lowest of the three which is to be expected as his language test scores are the most delayed (Figure 5.1). During the first three baseline sessions his performance declined which is unsurprising as during conversations he would lose his train of thought at times and his focus was more on the time of the day and how long the session would last. During the second baseline session, following his continuous checking and tapping of his wristwatch and his repeated requests to clarify 'how much time is left' before he can go back to class, Khalid was asked to remove his wristwatch and the desk clock was placed in the desk drawer. This was then implemented at the start of every consecutive session. Only then was he able to focus and had a better grasp of the concepts presented to him and this enabled him to make the greatest gains in accuracy with a 56% increase in performance. The following language samples from the first baseline and the 2-weeek follow-up sessions portray the development Khalid made on the retell task.

1st Baseline Session

The girl, she cough. She is sad. Then she take medicine. And she feel better.

Figure 5.1

Narrative retell progress for all three participants



2-week Follow-up session

When Katie was in the backyard. And she was uh, didn't catch the ball, the small one because it's too small. And she was sad because the ball was too small. So, she was, she ask her dad for help. And her dad said "I have an idea". And then she said 'let's choose a big ball'. And she has was happy that she catch the big ball.

Yousef was more focused in the sessions and though his language skills were slightly superior to those of Khalid, he still had difficulty in conveying his thoughts and ideas across and would supplement his speech with gestures. His performance peaks in the 7^{th} session and then drops back to baseline scores before improving again. This may be attributed to the lead up to the school year final exams that may have affected his performance. Though varied, his performance on the narrative tasks shows a gradual 39.3% increase. The following language samples from the first baseline and the 2-weeek follow-up sessions portray the development Yousef made on the retell task.

1^{st} Baseline Session

The girl she was sick. She is feel sad. Then she go the doctor, gave her some medicine. That's it.

2-week Follow-up session

Katie she's in backyard playing with his dad. She have problem, he is. She couldn't catch, she's very very small ball. She is sad because she couldn't catch. She said 'I need help'. The dad say, 'I know how to do'. He, he bring the big ball. She becomes very easy. And then when he is throwing, and then she, she is catching, she's very very happy.

Fahad started off with higher baseline scores than his peers as his CELF scores were the highest; his command of language was evident from the first session with his superior conversational skills – compared to Khalid and Yousef - as a more coherent dialogue was possible. However, his increase in accuracy in terms of overall story grammar, language complexity and episodic complexity was lower than his peers, at 25% only. Taking into consideration that Fahad is the youngest of the participants by one year exactly, this could attribute to him having reached the most possible gains he can achieve at his age. The following language samples from the first baseline and the 2-weeek follow-up sessions portray the development Fahad made on the retell task.

1st Baseline Session

She was sick. She was sad. She ask 'Can I have medicine?' The doctor gave her medicine. She feel better. The end.

2-week Follow-up session

Kim and his mum was at the kitchen, was eating dinner. Then Kim's teeth hurt. He was sad because his tooth has hurt. When his tooth hurt, he ask his mum to, to, to pull his teeth. Then she said 'I got an idea, I can bring the string'. After she pulled Kim's teeth, he was happy and he finished all his dinner. The end.

The 2-week follow up session placed all three boys at roughly the same level with Khalid, Fahad, and Yousef achieving final scores of 78.5%, 78.5%, and 82.1% respectively.

Statistical Analysis

Both the PEM and 2-SD Band consider the recorded changes in Khalid's retell performance to be significant (Table 5.1). A similar pattern is seen with Yousef; his PEM and 2-SD band scores are highly effective and significant while the C-stat for both boys are non-significant. Fahad's improvement on the retell task is found to be significant and highly effective across all three statistical analyses.

Table 5.1

Narrative Retell statistical analysis for all three participants

	PEM	2-SD Band	C-Stat
Khalid	0.7	3	0.58
Yousef	1	7	0.54
Fahad	1	6	0.7

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue =
< .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = significant change, Blue = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.2 STORY GRAMMAR

Narrative Retell

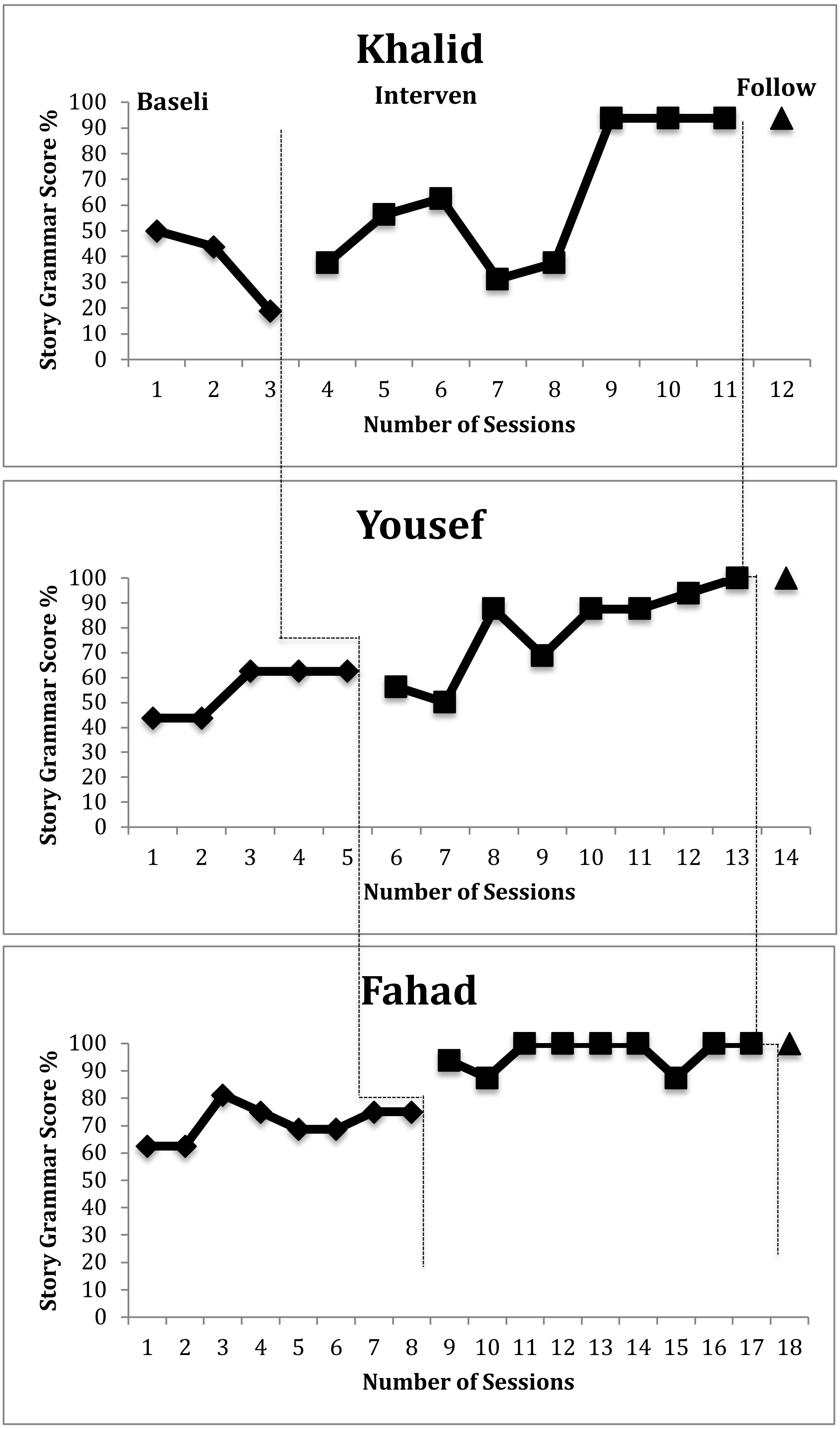
Visual Analysis

During the baseline phase of the narrative retell, the participants displayed different levels of performance (Figure 5.2). With the start of intervention, a steady increase can be seen with some fluctuations halfway through. All participants manage to maintain their peak in performance in the 2- week follow up. Below is a more detailed explanation of how each participant performed within the story grammar retell task.

Khalid started off with a baseline score of 50% that dropped by the third and final baseline session to 18.76%. His performance during the intervention slowly and steadily increased

Figure 5.2

Story grammar progress for retell task for all three participants



with a drawback in the fourth intervention session. His final intervention score was 93.75% that was maintained in the 2-week follow up session.

Yousef 's performance increased from 43.75% to 62.5% - roughly and 18% increase - within the baseline phase. He continued to perform better throughout the intervention achieving 100% by his final session and maintaining this improvement in the 2-week follow up session with another score of 100%.

Fahad started off with the strongest baseline scores as is expected due to his superior command of the English language compared to his peers. His scores ranged between 62.5% and 75% in the baseline. Towards the final session of the intervention, he scored 100% and maintained his score in the 2-week follow-up session.

<u>Statistical Analysis</u>

The improvement Khalid made on story grammar retell was considered significant by the 2-SD band method only (Table 5.2). Yousef and Fahad's performance was considered highly effective and significant by all three statistical analyses used.

Table 5.2

Story grammar statistical analysis in retell task for all three participants

	PEM	2-SD Band	C-Stat
Khalid	0.6	3	0.59
Yousef	0.9	5	0.71
Fahad	1	9	0.79

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = significant change, Blue = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.3 EMOTIONS

Narrative Retell

Visual Analysis

The ability of all participants to relate emotional words during the baseline phase ranges from not using any emotion words to using them half the required times (Figure 5.3). Following intervention, all participants progress and maintain that improvement in the 2-week follow-up sessions.

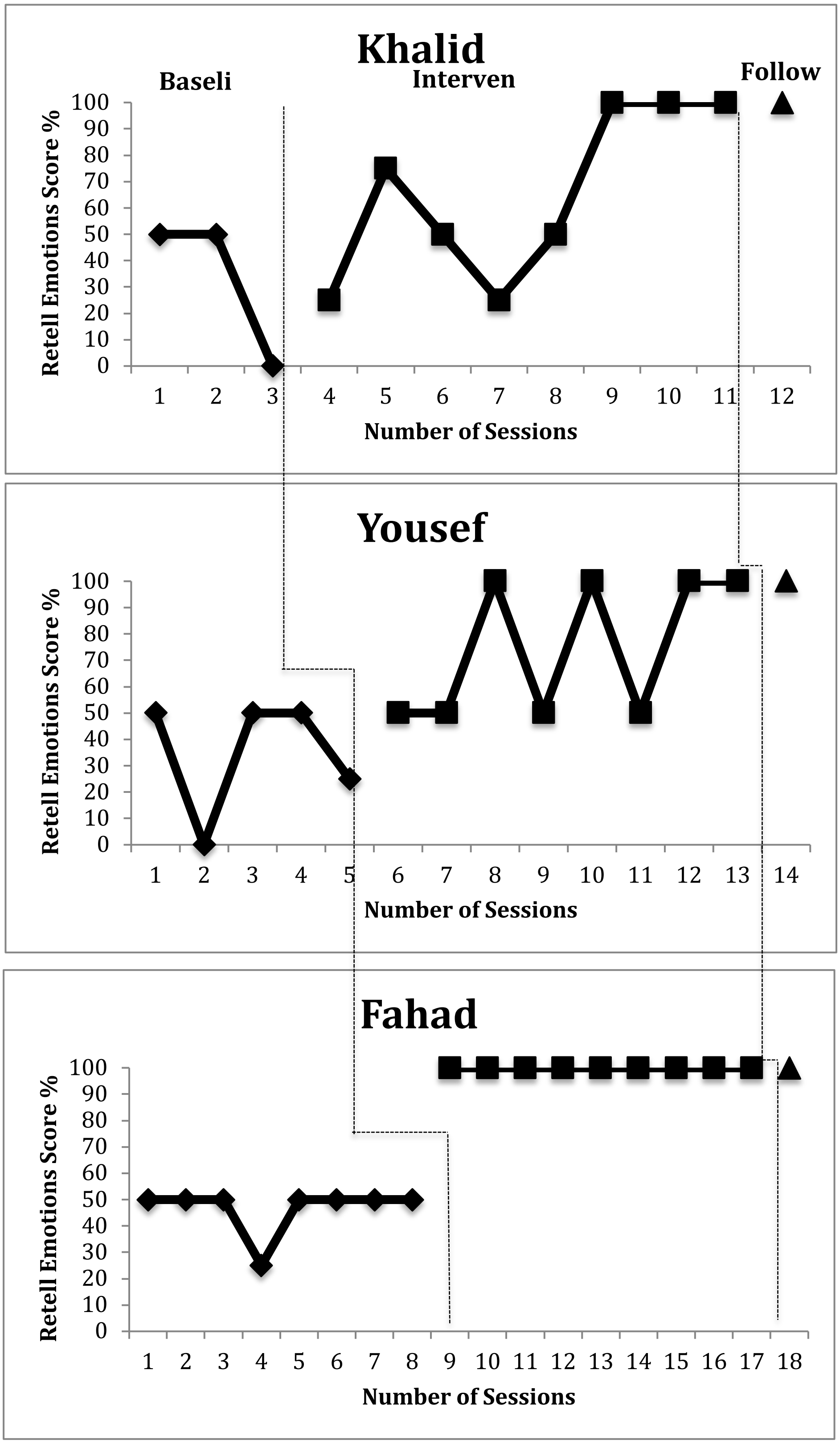
Khalid displayed an inconsistent ability to relate emotions throughout the first two phases. His baseline performance was 50% in two of his three sessions and he scored a zero on his third baseline session. The narrative treatment saw his performance slightly fluctuate in the intervention phase, yet each of his scores in the final three sessions was 100% and this was maintained in the 2-week follow-up session.

Yousef displayed a consistence in his performance of sometimes relating all emotions and sometimes relating only half. This can be seen in the zigzag lines in the intervention phase. He does stabilise in the last two treatment sessions scoring 100% and maintaining this percentage in the 2-week follow-up session.

Fahad was consistent in his performance during the baseline; he scored 50% repeatedly except for one session where he scored 25%. In the intervention phase he scores 100% in all his sessions and upholds this in the 2-week follow-up session.

Figure 5.3

Emotions progress in retell task for all three participants



Statistical Analysis

The PEM and the 2-SD band method find that all three participants have made significant improvements in their abilities to discuss emotions (Table5.3). The C-stat on the other hand found all the changes to be non-significant.

Table 5.3

Emotions statistical analysis in retell task for all three participants

	PEM	2SD	C-Stat
Khalid	0.75	3	0.56
Yousef	1	4	0.21
Fahad	1	8	0.65

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue =
< .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = significant change, Blue = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect

5.4 LANGUAGE COMPLEXITY

Narrative Retell

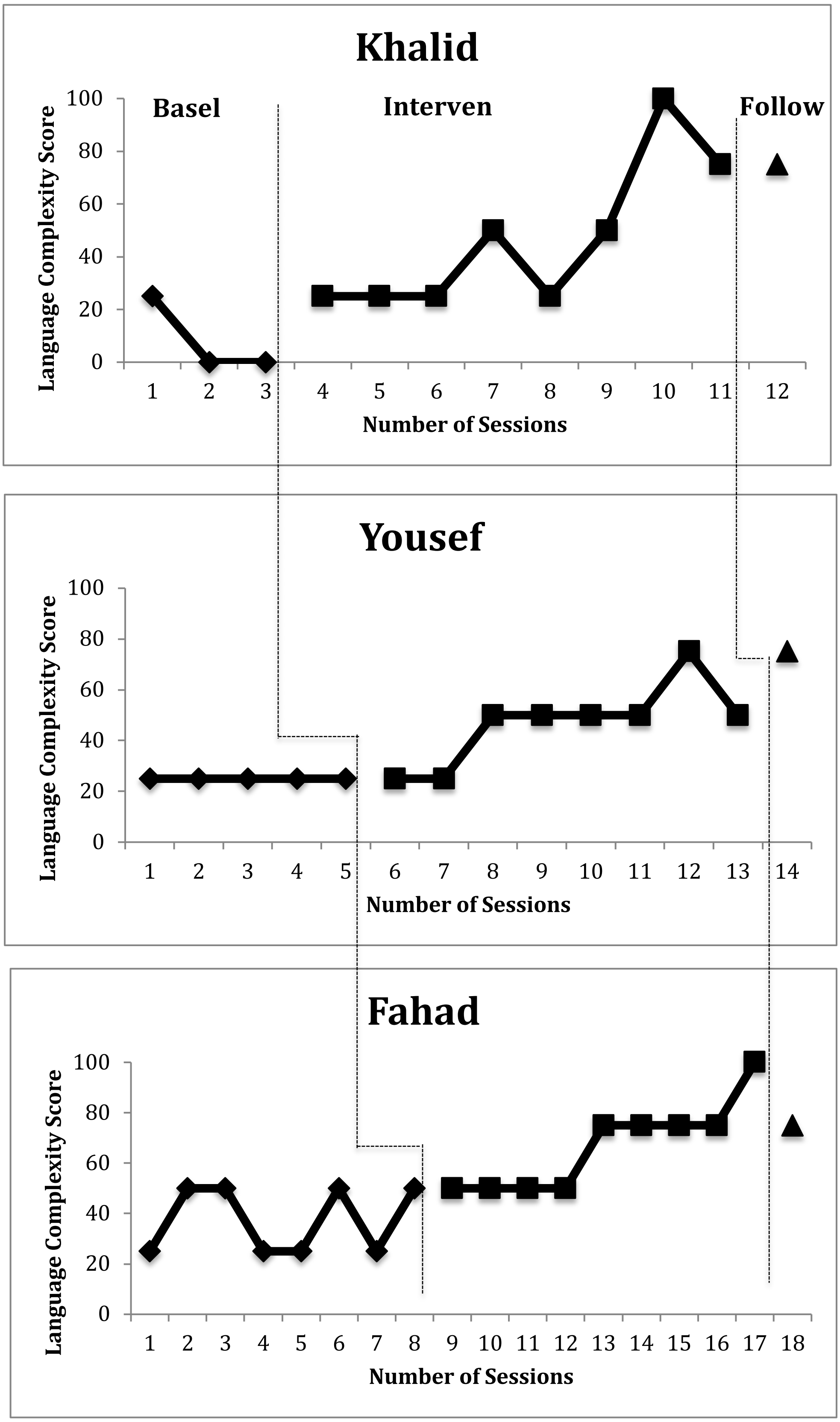
Visual Analysis

During the baseline phase, there was a clear struggle among all three boys in being consistent in their usage of language complexity components (Figure 5.4). Intervention did see a steady increase with two of the three participants and some maintenance of targets achieved in the 2-week follow up. Below is a more detailed breakdown of the performance of each participant.

Khalid started off with a baseline score of 25%, which dropped to zero in the second and third sessions. His performance did see an improvement by the fourth intervention session,

Figure 5.4

Language Complexity for retell task for all three participants



with continued fluctuations throughout. He maintained an increased score of 75% in the 2-week follow up.

Yousef was consistent in his performance with a score of 25% in the first 5 baseline sessions. The intervention did see him improve with the highest score of 75% in his seventh session, however, prior to this; his scores were steady and consistent as can be seen by the lines on his graph. He maintained the score of 75% in the 2-week follow-up.

Fahad had a fluctuating start with his baseline almost forming a zigzag between 25% and 50%. He steadies off in the intervention, gradually going from 50% to 75% and scoring 100% in the final session. He maintains a score of 75% in the 2-week follow up.

Statistical Analysis

The PEM and the C-Stat found that all three participants made an effective and significant improvement in their language complexity performance (Table 5.4). The 2-SD band method finds that only Khalid and Fahad made any significant improvement.

Table 5.4

Language Complexity statistical analysis in retell task for all three participants

	PEM	2SD	C-Stat
Khalid	1	4	0.7
Yousef	0.8	1	0.9
Fahad	1	7	0.9

PEM = Percentage of Data Points Exceeding the Median, 2-SD Band = Two-Standard Deviation Band, C-Stat = Concordance Statistic.
PEM interpretation; Green = .9 - 1 = highly effective, Purple = .7 - .9 = moderately effective, Blue = < .7 = questionable or no observed effect (Ma, 2006)
2-SD Band interpretation; Green = significant change, Blue = non-significant change
C-Stat interpretation; Green = Significant effect, Blue = Non-significant effect