

# **Assessment of anxiety in children and adolescents including children with Autism Spectrum Disorder**

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## Summary

Children and adolescents with Autism Spectrum Disorder (ASD) are at increased risk of anxiety disorders. Current assessment measures used to assess anxiety in children with ASD are standardized for neurotypical children posing a limitation to accurate assessment of anxiety in children with ASD. The aim of this thesis was to assess suitability of a currently used measure to assess anxiety in children and adolescents with ASD as well as to develop a new and improved parent measure to assess anxiety in children and adolescents with and without ASD. The thesis is comprised of two separate papers utilising two different samples (Study 1:  $N = 426$ ; Study 2:  $N = 734$ ). In study one, the measurement invariance of the Spence Children's Anxiety Scale (Parent Form, SCAS-P) in a sample of children with anxiety or ASD was assessed. It was hypothesised that the SCAS-P would perform differently in the ASD population than it did in the anxious population. Study two replicated findings of measurement variance for ASD in the SCAS-P in a new sample and also developed and evaluated a parent report measure for anxiety that will be suitable for clinical and non-clinical populations of children and youth including children with ASD. The newly developed measure, the Macquarie Anxiety Behavioural Scale (MABS) focuses on observable cognitive, behavioural and physiological symptoms of anxiety in children and adolescents including individuals with ASD. A confirmatory factor-analytic approach was used to establish the factor structure of the MABS and assess measurement invariance of the SCAS-P and MABS across a group of children with anxiety and ASD in Study 1 and a different group of children with and without ASD in Study 2. Both studies demonstrated measurement variance (difference) for both the SCAS-P and the MABS indicating that at least parts of both parent measures cannot be interpreted in the same way in an ASD population compared to typically developing children. The findings build upon a growing body of evidence which indicates that anxiety may present differently in young people with ASD compared to typically developing children and youth. Future research can utilise findings from the present

studies to refine and further develop an assessment measure that will be useful for children and adolescents including children with ASD.

**Certification by Candidate**

I hereby certify that this thesis has not previously been submitted for a higher degree to any other university or institution. Data collection, analysis and writing were all completed during my higher degree candidature. Approval for the research presented in this thesis was obtained from the Macquarie University Human Research Ethics Committee (Reference Number: 5201400308). To the best of my knowledge and belief, this thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

A handwritten signature in black ink, appearing to read 'Ramona Toscano', is centered within a light gray rectangular box.

Ramona Toscano

Date: 04/12/2017



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### Summary of Contributions to the two empirical papers

	Chapter 2	Chapter 3
Study conception	RT, HL, JH	RT, HL, JH
Data collection	RT, JH, HL, AK, TK	RT, LM
Data analysis	RT, AB, JH	RT, AB, JH
Interpretation of results	RT, AB, JH	RT, AB, JH
Paper preparation	RT	RT
Paper revisions	JH, AB, HL, RT	JH, AB, HL, LM, RT

The principal amount of work in each of the categories listed above was conducted by myself, the candidate – Ramona Toscano. I was the principal author for this thesis and for the two empirical papers. Co-authors’ initials in the table above are listed in order of their contributions to each empirical paper. Co-authors’ full names appear below.

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# **Chapter 1**

## **General Introduction**

## Introduction

Autism spectrum disorder (ASD) is a neuro-developmental condition characterised by deficits in social communication and interaction as well as the presence of restricted and repetitive interests and behaviours (American Psychiatric Association, 2013). Clinical observations and research findings frequently report that in addition to challenges arising directly from ASD type behaviour, anxiety disorders are also often present in the ASD population. Over the past decade, an increasing number of studies have assessed and reported on the presence and impact of anxiety in children and adolescents with ASD (e.g. Kerns, Kendall, Berry, Souders, Franklin, Schults, & Herrington, 2014; Ollendick & White, 2013); however, the underlying mechanisms of anxiety in ASD remain unclear.

A number of theories have been proposed to describe the concurrent presence of anxiety and ASD. Wood and Gadow (2010) proposed that anxiety disorders reflect either (i) a universal consequence of ASD, (ii) comorbidity (anxiety disorders separate from ASD and similar to anxiety disorders in non-ASD populations) or (iii) a unique manifestation of anxiety that is altered by the co-occurrence with ASD. Similarly, Kerns and Kendall (2012) proposed that anxiety is likely a co-occurring rather than distinctive feature of ASD and therefore not necessarily comorbid. They also suggested that individuals with ASD may present with ‘atypical’ anxiety symptoms that may be unique to ASD.

When two disorders share a number of similarities or common characteristics, co-occurrence is contingent on reliably differentiating between the two conditions being

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This thesis is presented in a ‘thesis by publication’ format as outlined and recommended by the Macquarie University Higher Degree Research Unit. It is comprised of four chapters consisting of two individual papers prepared for publication and an overall introduction and discussion. Due to the thesis’ structure, some repetition is unavoidable.

investigated. Differentiation between anxiety and ASD is difficult to establish partly due to the absence of suitable assessment measures to assess anxiety in children and adolescents with ASD. The majority of measurement tools currently being used, have been developed and validated for use in non-ASD populations (White, Schry, & Maddox, 2009), posing a significant limitation to the use and interpretation of results obtained when such measures are utilised with young people with ASD.

More recently, studies have started to address the issue regarding the valid assessment of anxiety in ASD by either examining the psychometric properties of currently existing measures in ASD populations (e.g. Glod, Creswell, Waite, Jamieson, McConachie, South, & Rodgers, 2017) or by developing new measures specifically designed for young people with ASD (e.g. Rodgers, Wigham, McConachie, Freeston, Honey, & Parr, 2016). Findings so far indicate that current measures need improvements whilst new measures developed need further validation and modifications. As the present research space continues to expand, it will be imperative to further our understanding of how ‘typical’ and ‘atypical’ anxiety co-occur in order to assist with development of improved measures of anxiety which will in turn guide treatment protocols.

This thesis presents an overview of the current literature on the relationship between anxiety and ASD as well as the challenges we currently face in the assessment of anxiety in ASD. A parent measure commonly used to assess anxiety in children and adolescents with ASD will be assessed for suitability in young people with ASD and its strengths and weaknesses for use in this population presented. Finally, a new parent measure of anxiety will be developed for use in children and adolescents with and without ASD and its psychometrics properties assessed. The studies presented within this thesis aim to better the assessment of anxiety in ASD by addressing current limitations frequently presented in the literature.

## **What are anxiety disorders?**

Anxiety is a very common emotion experienced by most individuals. At healthy levels, anxiety is adaptive, serves a protective purpose and helps individuals function at their best. However, for some people, anxiety can become a very overwhelming experience that is difficult to manage. When anxiety begins to significantly interfere in a person's life, anxiety no longer functions as an adaptive factor, but rather, may develop into an anxiety disorder. Anxiety disorders are characterized by persistent, excessive and unrealistic worry (Craske, Stein, Eley, Milad, Holmes, Rapee, & Wittchen, 2017) about everyday tasks or events or may be specific to particular objects. Thoughts and behaviours are key to understanding the expression of anxiety in individuals (Rapee et al., 2008). Individuals with anxiety disorders typically overestimate the danger in feared situations and avoid these situations (Beesdo, Knappe, & Pine, 2009; Rapee, Wignall, Spence, Lyneham, & Cobham, 2008; Stein & Craske, 2017). Such fears, worry and avoidance often give rise to significant interference in an individual's life.

A review by Baxter, Scott, Vos and Whiteford (2013) revealed that anxiety disorders are common worldwide, with one in 14 people meeting diagnostic criteria for an anxiety disorder at any given time. Accurate prevalence rates for anxiety disorders are difficult to obtain due to variability between studies; however, prevalence rates of approximately 2.5% to 5% have been reported for children and adolescents meeting criteria for an anxiety disorder (Rapee et al. 2009). Anxiety disorders are amongst the most frequently reported psychiatric disorders in childhood and adolescence (Albano, Chorpita, & Barlow, 2003), significantly impacting a child's development (Rapee, Schniering, & Hudson, 2009).

Of the different anxiety disorders outlined in the *Diagnosis and Statistical Manual of Mental Disorders* (5th ed., DSM-V; American Psychiatric Association, 2013) the most common

amongst school-aged youth are generalized anxiety disorder, separation anxiety disorder, social anxiety disorder, and specific phobia (American Psychiatric Association, 2013; Beidel & Turner, 2005; Silverman & Kurtines, 2001). Left untreated, anxiety disorders persist throughout childhood and adolescence leading to impairment and interference well into adulthood (Ramirez, Feeney-Kettler, Flores-Torres, Kratochwill, & Morris, 2006).

### **What is Autism Spectrum Disorder?**

Autism spectrum disorder (ASD) as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-V, 5<sup>th</sup> Edition; American Psychiatric Association, 2013) is a complex neurodevelopmental disorder that affects typical brain development. Individuals with ASD present with impairment in reciprocal social communication and social interaction as well as restricted, repetitive patterns of behaviour, interests, or activities. Sensory sensitivities such as difficulty coping with loud noises, specific textures and bright lights, are also frequently present amongst people with ASD making every day activities difficult to cope with. Symptoms present from early childhood and limit or impair everyday functioning. Information collated by the Centres for Disease Control and Prevention (CDC) indicates that approximately 1 in 68 children have been identified with ASD (Christensen et al., 2016). Studies in Asia, Europe, and North America report a prevalence of ASD in 1-2% of the general population, with ASD reported to occur in all racial, ethnic, and socioeconomic groups (CDC, 2016).

The level of impairment associated with ASD characteristics varies across individuals. Children with ASD all share social and communicative difficulties that are core features of autism, however severity of symptoms and level of functioning can vary widely. The specific cause for ASD is yet been identified, however, a growing body of evidence currently links autism to biological or neurological differences in the brain and indicates that it may be



inherited to a significant degree, that is, ASD is believed to have a genetic basis, although no single gene has been directly linked to ASD (National Autism Centre, 2015; Prior & Roberts, 2016).

### **The relationship between anxiety and Autism Spectrum Disorder (ASD)**

Anxiety has often been reported to be one of the most prevalent and impairing co-occurring conditions in children and youth with ASD (Gjevik, Eldevik, Fjæran-Granum, & Sponheim, 2011; Kerns, Kendall, Zickgraf, Franklin, Miller, & Herrington, 2015; White, Oswald, Ollendick, & Scahill, 2009) affecting about 40% of children and adolescents with ASD (van Steensel, Bögels, & Perrin, 2011). Numerous studies suggest that co-occurring anxiety difficulties are associated with poorer individual and family functioning (Kim et al. 2000; van Steensel et al. 2011; White et al. 2009).

The development of anxiety in youth with ASD is reportedly similar to that in youth without ASD (Kerns, Renno, Kendall, Wood, & Storch, 2016). Contributing factors include age and developmental level, a family history of psychiatric difficulties, familial accommodation of anxiety (Bolton, Pickles, Murphy, & Rutter, 1998; Mazefsky, Conner, & Oswald, 2010; Mazefsky, Folstein, & Lainhart, 2008), cumulative negative life events such as bullying and social rejection (Cappadocia, Weiss, & Pepler, 2012; Zablotsky, Bradshaw, Anderson, & Law, 2013) underlying emotion regulation and arousal difficulties (Green & Ben-Sasson, 2010; Mazefsky et al., 2013; White, Mazefsky, Dichter, Chiu, Richey, & Ollendick, 2014), and skill deficits (Kerns et al. 2016). Although frequently discussed, the phenomenology of anxiety in young people with ASD is poorly understood. Findings regarding specific characteristics (such as cognitive ability, child age and ASD severity) that are associated with anxiety in this population are inconsistent (van Steensel et al., 2011). Children and youth with anxiety and

ASD present with a number of overlapping symptoms including social avoidance, compulsive behaviours and perseveration versus rumination (Kerns et al., 2016). However, the underlying cause of some of these symptoms may be different. For instance, whilst social avoidance associated with anxiety may be due to a fear of negative evaluation, youth with ASD, may avoid social situations due to a general disinterest in social interactions (a symptom of ASD), a fear of negative evaluation (a symptom of comorbid social anxiety), or anxiety related to social confusion (an ambiguous anxiety-like symptom) (Kerns & Kendall, 2012; Kerns et al., 2016).

In addition to overlapping symptoms between anxiety and ASD, other ambiguous anxiety-like symptoms have also been reported in youth with ASD. Amongst these worries are anticipatory worries about change, negative reactions to change, fears surrounding restricted interests (such as worries about accessing preferred activities); and phobic responses to unusual stimuli, such as men with beards, specific sounds, or toilets (Kerns et al., 2014). Distinct sources of anxiety in individuals with ASD have also been reported in qualitative studies (Ozsivadjian, Knott, & Magiati, 2012; Trembath, Germano, Johanson, & Dissanayake, 2012). Changes in routine, lack of clarity around rules pertaining to social situations and interactions, and anxiety around special or obsessive interests and specific sensory experiences (e.g., loud noises, crowds, smells) are amongst the sources of anxiety reported specifically in the ASD population.

On differential diagnosis of anxiety disorders in cognitively-able youth with autism, Kerns and colleagues (2016) discuss how anxiety may present differently in young people with ASD compared to typically developing children and youth. They make the following observations about the different types of anxiety disorders: Separation Anxiety in ASD may result from excessive worry related to separation from attachment figures and/or a child's home (typical anxiety) or anxiety and avoidance that is triggered by separation that is associated more

with ASD-related challenges such as being left with someone who will not maintain the regular routine or being taken to places that will present social challenges. A perseverative cognitive style often found in children with Generalised Anxiety Disorder (GAD) is often also present in children with ASD. Young people with ASD may ask repetitive questions to elicit reassurance about worry (similar to repetitive questioning in typical GAD), process the anticipation of a novel event (more specific to ASD), or to manage discomfort about a skill deficit (also more related to ASD). Perseveration in ASD may also be a pleasurable activity rather than a distress response such as perseveration on preferred topics or ‘special interests’ in conversations. Therefore, perseveration alone in ASD is not synonymous with worry however; the underlying cognitive thinking style in GAD may contribute to the development of an anxiety disorder.

Intense fear of specific objects such as animals, flying and heights can present similarly in ASD as it does in typically developing children with anxiety; however, more idiosyncratic fears are also often reported in ASD (e.g., fear of men wearing hats, drawings of eyes in books; Mayes et al., 2013; Muris, Steerneman, Merckelbach, Holdrinet, & Meesters, 1998). Sensory sensitivity may also elicit an anxious response in young people with ASD. For example, difficulty coping with certain textures may elicit an anxious response to and avoidance of certain clothing. Kerns et al. (2016) suggests that one way of differentiating between a phobia and behaviours more directly linked to ASD is by differentiating anticipatory anxiety and avoidance of stimuli (e.g. avoidance of all department stores due to fear of loudspeakers) from momentary sensory discomfort (e.g. crying and trying to escape when a loudspeaker is used in the absence of anticipatory avoidance or worry).

In determining whether a child with ASD also meets criteria for social anxiety disorder, Kerns et al. (2016) encourage clinicians to assess whether the child’s anxiety is disproportionate

to any actual risk of the social interactions and situations, given the child's level of social functioning and social history. Social avoidance reflecting disinterest in social interaction (characteristic of ASD) versus a fear of negative evaluation (characteristic of social anxiety disorder) or a fear of social situations because of challenges with understanding, predicting, and navigating the social environment (characteristics of both anxiety and ASD) should also be considered (Kerns et al., 2016; White et al., 2009). That is, the quality of social fears in ASD is often different to the fears of negative evaluation and rejection characteristic of social anxiety disorder.

In summary, co-occurring anxiety disorders in ASD are associated with difficulties that go beyond what can be attributable to ASD alone. Kerns et al. (2016) suggested that ambiguity and overlap between anxiety and ASD symptoms may reflect similarities between anxiety and ASD symptoms in the ASD population. The increased level of difficulty experienced by children and adolescents with ASD warrants more research to define the underlying mechanism of anxiety as it presents in ASD. Whether ambiguity around anxiety symptoms is purely a reflection of the ASD phenotype or whether a co-occurring anxiety disorder exists is an area that requires further exploration. One of the current challenges we face is a lack of suitable measures to assess anxiety as it presents in children and adolescents with ASD (Kerns et al., 2016).

### **Assessment of anxiety in typically developing children and adolescents**

Before commencing any form of psychological intervention or treatment, a thorough assessment of the presenting problems and maintaining factors is necessary. A thorough initial assessment allows for clarity regarding an individual's current functioning and needs and establishes a baseline for progress monitoring and assessment of treatment outcomes (e.g. Meyer et al. 2001). Current best practice for both research and clinical purposes in the assessment of

anxiety and psychological functioning in children and youth involves a multimethod and multi-informant approach (e.g. Erford, 2013; Mash & Hunsley, 2005).

Current tools for the assessment of anxiety in children and adolescents include screening tools, diagnostic tools, measures for treatment planning and measures to determine treatment efficacy. These instruments take the form of clinician-initiated interviews, self- and other-report (e.g., parent, teacher) instruments and some instruments provide a combination of these response formats. Examples of such tools include the Anxiety Disorders Interview Schedule - Child and Parent Interview Schedules (ADIS-IV-C/P, Silverman & Albano, 1996), self-, parent-, and teacher-report versions of the Achenbach System of Empirically Based Assessment (ASEBA; Achenbach & Rescorla, 2001), the self- and parent-report versions of the State-Trait Anxiety Inventory for Children (STAIC; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1973; Strauss, 1987), the Multidimensional Anxiety Scale for Children (MASC, March et al., 1997), the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher, Brent, Chiapetta, Bridge, Monga, & Baugher, 1999), the Revised Children's Manifest Anxiety Scale, Second edition (RCMAS-2; Reynolds & Richmond, 2008), a self-report inventory, and the Spence Children's Anxiety Scale-Child and Parent Forms (SCAS-C/P, Spence, 1998,1999).

Integrating reports from multiple informants (e.g., students, caregivers, teachers) is particularly important as studies have shown low to moderate correlations between parent and youth reports of anxiety symptoms (Lagattuta, Sayfan, & Bamford, 2012; Nauta et al., 2004; Pereira, Muris, Barros, Goes, Marques, & Russo, 2015; Southam-Gerow, Flannery-Schroeder, & Kendall, 2003). Nauta et al. (2004) proposed that parents and children may conceptualize anxiety differently, and as such, when parents and children complete anxiety questionnaires, different underlying constructs may actually be measured. Another proposition put forward by

Grills and Ollendick (2002) was that parents are generally ill equipped to comment on the internal (e.g., thought processes and feelings) experiences of children. The combination of reporter discrepancies and lack of consensus regarding which source is more accurate, supports the practice of using multiple informants across various settings (Erford & Lutz, 2015).

### **Assessment of anxiety in children and adolescents with Autism Spectrum Disorder**

The assessment of anxiety in young people with ASD can present some challenges due to characteristics that are intrinsic to ASD such as communication difficulties, poor emotional insight and limited ability to report on internal experiences. The Autism Speaks Autism Treatment Network/Autism Intervention Research on Physical Health Anxiety Workgroup, a multidisciplinary team of clinicians and researchers with expertise in ASD, developed clinical recommendations regarding anxiety assessment and treatment, both in youth with ASD and typically developing youth (Vasa et al., 2016). The Workgroup recommended that assessment of anxiety requires a systematic approach to evaluating symptoms and potential contributing factors across various developmental levels.

Similar to the assessment of anxiety in typically developing children and youth, current evidence recommends multiple assessment modalities and informants when assessing anxiety in children with ASD (White et al., 2009; Wood & Gadow, 2010). Vasa et al. (2016) also recommend that, when assessing for anxiety in youth with ASD, behavioural observations should be conducted in addition to data collected from clinical interviews and rating scales gathered from multiple informants. In fact, when child self-report is compromised, assessors are often required to rely on reported observed behaviours of anxiety (Ozsivadjian et al., 2012). Behavioural symptoms that may suggest the presence of anxiety include avoidance and crying in response to specific stimuli or contexts, freezing behaviour, fearful affect, clinginess, and

increased repetitive behaviours and/or vocalizations, irritability, tantrums, disruptive behaviour, aggression, worsening sleep problems, and self-injury (Vasa, et al. 2016).

To date, only a few instruments to assess anxiety have shown promising results in regards to their validity when used with young people with ASD. For example, the Screen for Child Anxiety Related Emotional Disorder-71 (SCARED-71) showed comparable psychometric properties between youth with anxiety and those with ASD (van Steensel, Deutschman & Bögels; 2013). Internal consistency of the SCARED-71 was found to be good (Cronbach's alpha for total score = 0.92 - 0.95 for both the ASD and anxious groups and across all respondents – children, mothers and fathers; Cronbach's alpha =  $\geq .70$  for all sub- scales with the exception of the OCD subscale for the children in the ASD group). Evidence for construct validity was also found; correlations between the ADIS-C/P and the SCARED-71 within respondents ( $r = 0.36-0.57$ ), and correlations between respondents for the same anxiety measure ( $r = 0.39-0.75$ ) were all positive and reached significance. Sensitivity for the SCARED-71 child-report was found to be 0.81 for the ASD-group and 0.79 for the anxious group. The recently developed Anxiety Scale for Children - ASD, Parent and Child versions (ASC-ASD; Rodgers, Wigham, McConachie, Freeston, Honey, & Parr, 2016) also showed promising psychometric properties. Internal consistency of the ASC-ASD total score and subscales was good to excellent (Cronbach's alpha for the full-scale parent and child versions were both 0.94; alpha for subscales on the parent ASC-ASD ranged from 0.85 to 0.91). One month test-retest reliability was excellent for both the parent and child versions ( $r = 0.84$  and  $0.82$  respectively). Convergent validity was demonstrated by significant correlations between the ASC-ASD and the SCARED ( $r = 0.91$  and  $r = 0.88$  for the parent and child versions respectively). Despite promising findings, validity of the SCARED-71 was only assessed in a clinical population and as such, results cannot be generalised to non-clinical populations of children and youth with ASD. The

sample size utilised for the development of the ASC-ASD was also modest; replication of the study using a larger sample must be conducted to confirm stability and robustness of the finding obtained by Rodgers et al. (2016).

The validity of other anxiety measures assessed in the ASD population has yielded less promising results. The Multidimensional Anxiety Scale for Children (MASC), showed factor structures that differed between the anxious and ASD groups (White et al., 2015). Magiati et al. (2017) also conducted a Confirmatory Factor Analytic (CFA) assessment of the Spence Children's Anxiety Scale-Parent Version (SCAS-P; Spence, 1999) in a large international sample of young people with ASD. On testing four different factor models originally proposed by Nauta et al. (2004), Magiati and her colleagues found that none of the models tested provided adequate fit for the ASD sample in their study. In the absence of well-validated measures or ASD-specific measures to assess anxiety in children and adolescents with ASD, clinicians need to rely on assessment measures originally designed for typically developing children. In this instance, Vasa et al. (2016) recommend cautious interpretation of results obtained from anxiety measures designed for typically developing children, when such measures are administered to young people with ASD. They also suggested that clinicians ask questions about behavioural signs of anxiety (e.g., social avoidance associated with fearful affect, irritability, or physiologic symptoms) to help differentiate between overlapping symptoms that are explained solely by ASD and symptoms that are consistent with a co-occurring anxiety disorder.

Kerns et al. (2016) reported on the need for psychometrically sound measures to systematically differentiate and assess comorbid anxiety disorders and other, more ambiguous anxiety-like behaviours in children with ASD. As previously mentioned, a considerable number of children with ASD exhibit atypical anxiety symptoms that are linked to the core features of



ASD such as anxiety about sensory stimuli and anxiety around changes to routines or transitions. Ambiguity and overlapping anxiety and ASD symptoms therefore necessitate not only the standard modalities of child anxiety assessments but also a focus on atypical symptoms that are prominent in the ASD population. Future assessment tools should incorporate items that address ASD specific anxiety symptoms such as atypical fears and anxiety around sensory experiences.

### **The present research**

There are a series of challenges that currently exist in understanding how anxiety presents in young people with ASD. The underlying mechanisms of anxiety in children and adolescents with ASD are poorly understood; ongoing empirical investigation is therefore necessary. Improved assessment measures to accurately assess anxiety in the ASD population are a much-needed step in this direction. In particular, assessment measures that differentiate between anxiety symptoms that stem from an anxiety disorder versus ambiguous and overlapping anxiety like symptoms that are characteristic of ASD are needed. Current measures being utilised to assess anxiety in children and adolescents with ASD have a number of limitations and lack inclusion of behavioural items which could assist in differentiating anxiety from ASD-specific symptoms. This thesis presents two studies utilising different samples, based on a nomothetic approach. Quantitative data and statistical analysis were used to determine suitability of a current assessment measure of anxiety for children and adolescents with ASD as well as develop a new assessment measure and establish its psychometric properties.

The first study is presented in Chapter 2. The aim of this study was to assess the utility of a frequently used parent measure of anxiety - the Spence Children's Anxiety Scale - Parent

Form (SCAS-P; Spence, 1999) across two different groups of parents. We intended to extend upon findings by Magiati et al. (2017) on the psychometrics properties of the SCAS-P by using a different statistical process to assess the measurement invariance of the SCAS-P across a group of Australian children with anxiety and ASD. More specifically, Multiple Indicator – Multiple Cause (MIMIC) modelling was used to assess differences in the factor structure of anxiety between parents of children with anxiety and parents of children with ASD.

Measurement invariance of the SCAS-P in a sample of children with a diagnosis of anxiety or ASD was tested to determine the performance of this measure in an ASD population. We hypothesised that the SCAS-P would perform differently in the anxious and ASD populations indicating that psychometric properties cannot be generalised across both groups.

The second study is presented in Chapter 3. The purpose of this study was to develop and evaluate a new parent report measure for anxiety that will be suitable for clinical and non-clinical populations of children and youth. The newly developed measure, the Macquarie Anxiety Behavioural Scale (MABS) focuses on observable cognitive, behavioural and physiological symptoms of anxiety in children and adolescents. The measurement invariance of the SCAS-P (in the new sample) and the MABS was assessed to determine the performance of these two measures in an ASD population.

The final chapter provides a discussion of the findings from these two studies. Implications of the findings in relation to the assessment of anxiety in ASD as well as our understanding of the presentation of anxiety in young people with ASD are presented. Finally, strengths and limitations of the present research as well as directions for future research are presented.

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## **Chapter 2**

**Assessment of anxiety in children and adolescents: A comparative study on the validity and reliability of the Spence Children's Anxiety Scale in children and adolescents with anxiety and Autism Spectrum Disorder**

**Assessment of Anxiety in Children and Adolescents:  
A Comparative Study on the Validity and Reliability  
of the Spence Children's Anxiety Scale in Children  
and Adolescents with Anxiety and  
Autism Spectrum Disorder**

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## Abstract

**Objective:** The purpose of the present study was to assess the utility of a frequently used parent measure of anxiety symptoms- the Spence Children's Anxiety Scale - Parent Form (SCAS-P; Spence, 1999) across two different groups of parents. Differences in the factor structure of anxiety between parents of children with anxiety and parents of children with Autism Spectrum Disorder (ASD) were explored. Measurement invariance of the SCAS-P in a sample of children with a diagnosis of anxiety or ASD was conducted to determine the performance of this measure in an ASD population. We hypothesised that the SCAS-P would perform differently in the anxious and ASD populations indicating that it is less suitable for use in young people with ASD. **Method:** Secondary data from a number of studies conducted in Australian research-based clinics were collected. A sample of 426 parents of children aged 7-18 years (matched for age and gender) with a diagnosis of anxiety or ASD completed the SCAS-P. A confirmatory factor analytic approach, more specifically multiple indicator multiple cause (MIMIC) structural equation modelling was utilized to analyse the data. Items across the six scales of the SCAS-P were tested across the two groups. **Results:** Confirmatory factor analysis revealed different factor structures between the Anxious and ASD groups. Evidence for measurement variance across the two groups was found in some parts of the SCAS-P. MIMIC modelling showed that two of the six SCAS-P subscales (Physical Injury Fears and Obsessive Compulsive) and eleven of the individual SCAS-P items performed significantly differently across the two groups under investigation. **Conclusion:** Scores obtained when using the SCAS-P with children and adolescents with ASD need to be interpreted with caution. Some items of the SCAS-P cannot be interpreted in the same way in an ASD population compared to neurotypical children with anxiety. Directions for future research in the presentation of anxiety disorders in ASD are discussed.

*Keywords:* Anxiety, Autism Spectrum Disorder (ASD), Assessment, Children,  
Adolescents



**Assessment of anxiety in children and adolescents: A comparative study on the validity and reliability of the Spence Children's Anxiety Scale in children and adolescents with anxiety and Autism Spectrum Disorder**

It is a well-documented fact that young people with Autism Spectrum Disorder (ASD) also commonly experience other developmental, emotional or behavioural difficulties (e.g. Roberts, Williams, Smith, & Campbell, 2016). Anxiety disorders are the most common psychiatric comorbidities seen in ASD (White, Oswald, Ollendick, & Scahill, 2009), affecting about 40% of children and adolescents with ASD (van Steensel, Bögels, & Perrin, 2011). MacNeil, Lopes and Minnes (2009) reported that young people with ASD have higher levels of anxiety than typically developing children and comparable levels of anxiety to typically developing clinically anxious children.

The presentation of anxiety in young people with and without ASD shares some common features, such as social fears that are characteristic of Social Anxiety Disorder (Settipani, Puleo, Conner, & Kendall, 2012). However, other features are more unique to ASD, such as impaired social functioning and social confusion, theory of mind deficits, sensory sensitivities, and repetitive and restricted behaviours (Bellini 2004, 2006; Kerns et al., 2014; Ollendick & White, 2013). Individuals with ASD access, process and interpret emotions in an atypical fashion (e.g. Shalom et al., 2006; White, Mazefsky, Dichter, Chiu, Richey, & Ollendick, 2014), leaving them vulnerable to anxiety symptoms that result in impairment beyond that caused by the core symptoms of ASD (Ozsivadjian, Knott, & Magiati, 2012). Thus, young people with ASD may be predisposed to anxiety as a result of a range of ASD-specific factors.

A number of explanations have been proposed for the observed rates of comorbidity between anxiety and ASD including diagnostic overlap and the fact that measures of anxiety often used with children with ASD, were developed for non-ASD populations. In a review on the presentation and classification of anxiety in ASD, Kerns and Kendall (2012) suggested that anxiety is likely a co-occurring rather than characteristic feature of ASD and therefore not necessarily comorbid. They suggested that anxiety symptoms may either be closely related to difficulties present in ASD or reflect anxiety altered in presentation by its co-occurrence with ASD. However, it is not possible to make definitive conclusions regarding comorbidity versus co-occurrence of symptoms in anxious and ASD populations because measurement invariance of assessment tools used across studies has not yet been established.

The assessment of anxiety in ASD has relied mainly on measures originally developed and validated for use in typically developing populations (White, Schry, & Maddox, 2012). Current assessment tools used to assess anxiety in children and adolescents with ASD include diagnostic interviews such as the Anxiety Disorders Interview Schedule - Child and Parent Interview Schedules (ADIS-IV-C/P; Silverman & Albano, 1996) as well as parent and self-report measures such as the child- and parent- forms of the Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, and Conners, 1997) and the Spence Children's Anxiety Scale-Child and Parent Forms (SCAS-C/P; Spence, 1998). These measures are psychometrically sound; however, they are standardised for neurotypical children, posing a limitation to current assessment of anxiety in ASD.

The reliability and validity of anxiety measures in young people with ASD has been frequently questioned (Kaat and Lecavalier, 2015; Sterling et al., 2015; van Steensel, Deutschman, & Bögels, 2013). Amongst the anxiety measures assessed for suitability in the

ASD population are the Multidimensional Anxiety Scale for Children (MASC; March et al., 1997), the Screen for Child Anxiety-Related Emotional Disorders (SCARED-71; Bodden, Bögels, & Muris et al., 2009), and the self- and parent-report Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000). Findings regarding the validity and reliability of such measures in the ASD population are mixed. For example, in a comprehensive literature search conducted by Grondhuis and Aman (2012), a number of anxiety scales used with children and adolescents with ASDs were reviewed. Poor to excellent reliability and validity levels were reported, indicating that current measures used to assess anxiety in young people are not necessarily applicable to the ASD population and as such, caution must be exercised when interpreting results.

Another challenge related to the assessment of anxiety in young people is parent-child disagreement. Current best practice in assessment of psychological functioning in children and young people is multiple-informant report (e.g. Mash & Hunsley, 2005). Results from a meta-analytic study conducted by Stratis and Lecavalier (2015) also highlighted the need to use multiple informants when assessing psychological functioning in youth with ASD. Information obtained from significant people in a child's or young person's life, such as a parent, caregiver or teacher is crucial in obtaining an accurate and comprehensive representation of the individual being assessed. However, reporter discrepancies in assessment of anxiety in typically developing children and adolescents using currently available measures have frequently been cited in the literature (Lagattuta, Sayfan, & Bamford, 2012; Pereira et al., 2015). Similar conclusions have been drawn about parent-child anxiety symptom reporting agreement in ASD, where current evidence indicates low-to-moderate agreement (Ooi et al., 2016). Results obtained by Storch et al. in 2012, indicated that parent-child agreement on the presence of clinical levels

of anxiety between parents and children of youth with ASD is poorer than agreement between parents and their neurotypical children.

Within the ASD population, researchers have questioned the ability of young people with ASD to self-report internal emotional states (Baron, 2006; Ghaziuddin, M., Ghaziuddin, N., & Greden, 2002; Green, Gilchrist, Burton, & Cox, 2000; Groden, J., Baron, & Groden G., 2006). Discussions around why these inconsistencies exist have largely focused on the difficulties which commonly occur in those with ASD and differences in how individuals with ASD convey thoughts, physiological experiences, or affective states to others (Harms, Martin, & Wallace. 2010; Losh & Capps, 2006). Amongst the difficulties are poor insight, impaired affect recognition, inherent communication difficulties, limited ability to communicate about internal experiences, and rigidity in thinking (e.g. Lickel, MacLean, Blakeley-Smith, & Hepburn, 2012). As such, the use of self-report anxiety screening tools for children and youth with ASD has been questioned (Mazefsky et al. 2011; White, Schry, & Maddox, 2012).

Despite parent-child disagreement being frequently cited in the assessment of anxiety in children and adolescents, especially in the ASD population (e.g. Achenbach, McConaughy, & Howell, 1987; Choudury et al., 2003; Storch et al., 2012), challenges with self-report of anxiety in young people with ASD outlined above result in clinicians relying primarily on parent reports when assessing anxiety in children. To date, little is known about the cross-diagnostic (Anxiety vs. ASD) robustness of most measures used when assessing anxiety in children and adolescents. Anxiety measures which take into consideration ASD symptomatology such as intolerance of uncertainty and sensory fears, have been developed only recently (e.g. Rodgers et al., 2016). Hence, anxiety measures originally developed for individuals without ASD, are still widely used to study anxiety in those with ASD (e.g. Clarke, Hill,& Charman. 2016; Ooi et al. 2016).

The Spence Children's Anxiety Scale (SCAS-C; Spence, 1998) and its corresponding parent/care-giver version (SCAS-P; Spence, 1999) are amongst the measures that are routinely used in clinical and research practice as a measure of anxiety symptoms in young people with and without ASD (e.g. Chalfant, Rapee and Carroll, 2007; McConachie et al. 2014; Rodgers, Riby, Janes, Connolly, & McConachie, 2012; Sung et al., 2011). The SCAS-P is a 38-item questionnaire completed by parents or care-givers to assess the severity of a range of anxiety symptoms in children ages 6–18. The SCAS-P was designed to assess children's symptoms of anxiety along the structure of the Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM-IV-TR American Psychiatric Association, 2000). Although the SCAS-P has been reported to have sound psychometric properties in typically developing children (Nauta et al., 2004), further examination of its use for both clinical and research purposes in the ASD population has been recommended (Grondhuis & Aman, 2012). Russell and Sofronoff (2004) noted significant differences in parent–child ratings on the SCAS in a clinical sample of children with Asperger Syndrome. More recently, May, Cornish and Rinehart (2015) assessed parent-child agreement using the SCAS where results indicated generally good correlations between parent and child self-reported SCAS symptoms for typically developing children but poor agreement in parent-child ASD dyads. Consistent with clinical observations, findings suggested that 8–13-year-old children with ASD may have difficulties accurately reporting their anxiety levels.

Recent studies (Jitlina et al., 2017 and Magiati et al., 2017) have shown that the original six-factor structure of the SCAS-P as suggested by several studies (e.g. Arendt, Hougaard, & Thastum, 2014; Ishikawa et al., 2013; Nauta et al. 2004;) was not a good fit based on confirmatory factor analysis (CFA) with large samples of young people with ASD. Suggestions for the lack of fit of the original structure of the SCAS-P in childhood ASD populations include

characteristics of ASD that impact anxiety presentation and potential differences in the underlying conceptual and structural basis of the SCAS-P anxiety symptoms in ASD. To our knowledge, no replicable alternative structure for the SCAS-P has been proposed to date. It remains unclear whether the SCAS-P measures the same constructs in ASD as it does in typically developing clinically anxious children (without ASD). Moreover, the subsequent question of whether this instrument measures the construct in the same way, should also be addressed to enable valid comparisons of observed scores across groups to be made. Further investigation is required to enable confidence that the scale functions in the same way across clinical groups. In order to establish whether a given measure of a particular latent construct (such as anxiety) performs similarly across the groups, a test of measurement invariance is to be performed (Vandenberg & Lance, 2000). Only then can meaningful comparisons between groups be made as measurement invariance analysis indicates whether the instrument measures the same construct in the same way across different populations or groups (Millsap & Kwok, 2004).

To our knowledge, there has only been one very recent attempt at assessing measurement invariance to compare assessment of anxiety in separate clinical groups. Glod et al. (2017) conducted a study to determine the factor structure for the SCAS-P in a sample of young people with ASD and to compare it with the factor structure derived from a sample of clinically-anxious young people without ASD, and in the combined (anxious and ASD) sample to ensure adequate fit to consider invariance. Measurement invariance techniques were also planned to determine whether SCAS-P items function in the same way in children with ASD and anxious children without ASD, in order to establish whether cross-groups comparisons using the SCAS-P are appropriate and meaningful. Unfortunately, due to poor model fit and lack of an adequate baseline model for further between group model testing, it was not possible to perform

measurement invariance analyses. Investigation of the factor structure of the SCAS-P in the anxious and ASD samples was instead pursued through exploratory factor analysis (EFA). Therefore, the present study is the first to assess the measurement invariance of the SCAS-P across a group of children with anxiety versus children with ASD.

A common limitation across studies that have assessed use of the SCAS-P in the ASD population is the identification of the specific factors or items within the SCAS-P that are performing differently across the anxious and ASD groups and where specifically these differences lie. In the present study, we aim to address this gap in the literature by assessing whether, based on parent report, items of the SCAS-P measure the same constructs (have the same factor structure) and if there is evidence of equivalent relationships to these constructs (equal factor loadings) in both subgroups. We assessed whether there are subgroup differences (Anxious versus ASD) that impede responding to the SCAS-P in comparable ways. Measurement invariance tests on the SCAS-P will shed light on the nature of group differences in child anxiety between children with and without ASD. When using the SCAS, some group variations are partially corrected by using sex- norms and cutoff scores (e.g. Albano & Krain, 2005). However, such norms and cutoff scores are not yet available for the ASD population. We believe that diagnostic group differences when measuring anxiety can be further revealed via strong invariance tests. That is, a parent of a child with ASD (with or without anxiety) will rate SCAS items, such as “My child worries that something awful will happen to someone in our family,” “My child can't seem to get bad or silly thoughts out of his / her head,” “My child worries what other people think of him/her,” at a different frequency compared to a parent of a child without ASD.

Parents of children with ASD often report that whilst they attempt to interpret their children's anxiety based on behavioural indicators or patterns of behavioural responses, they often find it difficult to confirm their observations due their children's lack of ability to communicate effectively about their emotions, thoughts and internal states. This indicates a lack of suitability of the SCAS-P in measurement of anxiety in children and adolescents with ASD. Thus, in addition to examining structure across groups, the present study tested whether the SCAS-P measures levels of anxiety similarly in children with anxiety versus children with ASD. Cross-group (Anxious, ASD) measurement invariance of anxiety symptoms based on the SCAS-P was evaluated. Invariance tests were used to compare anxiety, a latent construct that is not directly observable, across children and adolescents with anxiety and ASD based on parent report. Given our sample size, we elected to use multiple-indicators-multiple-causes (MIMIC) modelling to assess invariance across the Anxious and ASD groups when using the SCAS-P and more specifically highlight where such differences lie. MIMIC modelling has been used successfully in other studies to assess the differences in the factor structure of latent variables such as depression across two different groups of people (e.g. Skule et al. 2014). We hypothesised that anxiety presents differently across these two groups.

## **Method**

### **Participants**

Secondary and archival data from three different sources was used for the current study. Ethics approval to access and use de-identified secondary and archival data was sought and obtained from Macquarie University Human Research Ethics Committee, Sydney, Australia. Ethics approval for use of data in ASD Data Source 2 is described below. The study involved 426 parents of children aged 7 to 18 years with a diagnosis of an anxiety disorder or Autism Spectrum Disorder (ASD). The sample was composed primarily of parents of children with a



primary diagnosis of an anxiety disorder (71.2%) or ASD (21.5%). 7.2% of children met criteria for a primary diagnosis of other mental health conditions (for example Major Depressive Disorder, Attention Deficit/Hyperactivity Disorder) but also had an anxiety disorder and/or ASD appearing in their profile. All children were seeking treatment for anxiety.

Data from two groups of parents were analysed, namely parents of anxious children and parents of children with ASD some of whom also met criteria for an anxiety disorder. The anxious sample was selected to age and gender match the ASD sample. Our overall sample was composed mainly of English speaking parents born in Australia. Data indicates that the children of parents in our sample were less likely to come from lower income families (Anxious group: low income = 23.9%, normal income = 76.1%; ASD group: low income = 3.2%, normal income = 96.8%;  $\chi^2(1) = 0.000$ ,  $p < .05$ ). There were no other significant differences between the two groups. Table 1 presents demographic characteristics and frequency of disorders in the samples.

To be included in the study, parents had to have completed the Spence Children's Anxiety Scale for Parents (SCAS-P; Spence, 1999). Where both mother- and father- SCAS-P data were available, only mother-report data were included in the overall analysis. Participants were excluded from the study if their children presented with psychoses, severe suicidal ideation, severe oppositional defiant disorder across more than one setting, intellectual disability or if they were receiving concurrent psychotherapeutic intervention. Additional information about exclusion criteria for the second data source within the ASD group is outlined below.

### ***Anxious Group***

Archival data from the Centre for Emotional Health, Macquarie University, Sydney, Australia was retrieved to form part of this sample. This sample included 319 parents of children

and adolescents aged 7-18 years old whose children met criteria for a primary (most interfering) diagnosis of any anxiety disorder (according to DSM-IV-TR; American Psychiatric Association, 2000) and participated in randomized clinical trials, manual based treatment programs, assessment, treatment and ongoing clinical services for childhood anxiety between trials at the Centre for Emotional Health Clinic at Macquarie University from 2000 through 2015. Diagnoses and clinical severity ratings were assigned based on the Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent versions (ADIS-IV-C/P; Silverman & Albano, 1996), a structured interview administered by graduate students in clinical psychology or qualified clinical psychologists.

### ***ASD Group***

The ASD group was comprised of 107 participants from two different sources.

### ***ASD Data Source 1***

The first sample ( $n = 22$ ) included parents of children aged 7-12 years with a diagnosis of ASD and anxiety recruited from the Macquarie University Emotional Health Clinic in Sydney, Australia, through advertisements placed with local ASD service providers and online advertising through the Autism Spectrum Australia (ASPECT) website. Children in the ASD-anxious sample had a documented diagnosis of Asperger's Syndrome, Autistic Disorder/Autism Spectrum Disorder or Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS) as per DSM-IV-TR (APA, 2000), and had been diagnosed by a paediatrician or clinical/developmental psychologist prior to enrolment in the study. Anxiety status of the children in the ASD-anxious sample was also assessed via telephone or face-to-face interview using the ADIS-C/P (Silverman & Albano, 1996).

In addition, archival data ( $n = 42$ ) from the Centre for Emotional Health, Macquarie University, Sydney, Australia was also retrieved and utilized. This group consisted of parents whose children were aged 7-18 years and met criteria for Asperger's Syndrome, ASD or PDD-NOS and at least one anxiety disorder/s as per DSM-IV-TR (APA, 2000). Parents in this group sought assessment and treatment and participated in randomized clinical trials for childhood anxiety at the Centre for Emotional Health Clinic at Macquarie University between 2000 and 2015. Anxiety diagnoses and clinical severity ratings were assigned based on the ADIS-IV-C/P (Silverman & Albano, 1996), administered by graduate students in clinical psychology or qualified clinical psychologists. Archival data participants were allocated to the ASD group if they (i) had a pre-existing diagnosis of Asperger's Syndrome, ASD or PDD-NOS or if they endorsed an ASD screener that was created as an addition to the ADIS-IV-C/P and (ii) met criteria for Asperger Syndrome based on the structured clinical interview - The Asperger Syndrome (and high-functioning autism) Diagnostic Interview (ASDI, Gillberg, Gillberg, Rastam, & Wentz, 2001).

### ***ASD Data Source 2***

The second sample ( $n = 43$ ) included parents of adolescents between the ages of 12 and 18 years who presented for anxiety treatment at Curtin University Psychology Clinic, Perth, Western Australia. Parents were recruited through local schools, disability organisations and parent support groups in Western Australia. Data used for the present study were originally collected as part of a randomized-control trial comparing an active treatment condition (group Cognitive Behaviour Therapy) to a waitlist control condition. Custodians of the original data set confirmed that ethics approval for their study was obtained from the Curtin University Human Research Ethics Committee (Approval Number: HR127/2010), the Education Department of WA and the Catholic Education Office (WA). Registration as a clinical trial with the Australian

and New Zealand Clinical Trials Registry (2007) was also gained (Trial ID: ACTRN12610001014044). All youth in the study met criteria for at least one anxiety disorder as determined by the Anxiety Disorders Interview Schedule for DSM-IV: Child and Parent Version (ADIS-C/P; Silverman & Albano, 1996), had a current clinical diagnosis of autism, Asperger's Syndrome, or Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS), had a verbal IQ above 70 and were not taking any psychotropic medication or taking a stable dose of psychiatric medication (i.e. at least one month at the same dosage prior to baseline assessment). Participants were excluded from the study if: 1) the adolescent participated in psychotherapy, social skills training, or behavioural intervention such as applied behavioural analysis over the course of the study, including 6-months following end of treatment for the intervention group; 2) the family were attending child-related health professional services or parenting classes; 3) the adolescent began taking psychiatric medication or changed his or her dosage during the intervention period and for 6 months post-treatment for the intervention group; or 4) the family were not able to participate in the intervention program.

Parents of children and adolescents from both ASD data sources were ultimately combined to allow for a large age spread that was more in line with the children's age range in the Anxious sample. As such, two groups were created; that is, parents of children with anxiety and parents of children with ASD.

## **Measure**

The Spence Child Anxiety Scale for Parents (SCAS-P; Spence, 1999) was used to assess parent-reported anxiety symptoms. The SCAS-P comprises 38 items designed to assess child anxiety symptoms across six domains: separation anxiety, generalized anxiety, social phobia, panic/agoraphobia, obsessive–compulsive disorder, and fear of physical injuries. For each item,

parents or caregivers select the response that best describes how often their child experiences a given feeling, thought, or behaviour. Items are rated on a four-point Likert-type scale; 0 (never), 1 (sometimes), 2 (often), or 3 (always). Higher scores indicate increased levels of anxiety. The items of the SCAS-P were formulated as closely as possible to the corresponding item of the child version of the SCAS (Spence, 1998), which was developed to assess anxiety symptoms in children in the general population. The SCAS-P provides a total anxiety score as well as six subscale scores developed to reflect symptoms characterized by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; APA, 1994). The measure shows generally good psychometric properties in typically developing populations and is commonly used for both research and clinical purposes. For example, results of confirmatory factor analysis (Nauta et al., 2004) supported a model with six intercorrelated factors that correspond with subscales predicted from the DSM-IV (APA, 1994) anxiety disorders. Reliability coefficients of the subscales are satisfactory to excellent; 0.81 to 0.90 in the normal control group and from 0.83 to 0.92 in the clinical group. Nauta et al. (2004) reported evidence for both convergent and divergent validity of the SCAS-P. The SCAS-P showed good convergent validity, both with another parent measure Child Behavior Checklist – Internalizing (CBCL; Achenbach, 1991) and with the child measure of anxiety symptoms (SCAS; Spence, 1998).

### **Statistical Analysis**

Analysis was conducted using the software package Lavaan (versions 0.5.18 to 0.5.22, Rosseel, 2012) in open source software R (v3.3.1, R Core Team, 2012). Missing data for responses on the SCAS-P (0.7%) was managed by using maximum likelihood estimation method of data imputation. Differences in factor structure of the SCAS-P between the group of parents of children with anxiety and another group of parents of children with ASD (with and without anxiety) was examined using MIMIC (multiple-indicators-multiple-causes) modelling.

Due to a relatively small ASD sample compared to the anxious sample, MIMIC modelling was deemed most suitable to examine invariance across both groups. MIMIC modelling (also known as Confirmatory Factor Analysis with covariates) entails regressing the latent variables and indicators onto covariates that represent group membership (Diagnosis: 0 = anxiety, 1 = ASD).

In the present study, Brown's (2015) MIMIC modelling guidelines were followed. When using MIMIC modelling, a single input matrix containing variances and covariances of both the latent variable indicators and the covariates that denote group membership is used. First, a viable measurement model using the full sample (collapsing across groups) is used. For the purpose of this study, the internal structure of the SCAS-P was assumed to be as previously reported (Arendt et al. 2014; Ishikawa et al. 2013; Li et al. 2011; Nauta et al. 2004); that is, a six-correlated factor model corresponding with DSM-IV (APA, 1994) anxiety disorders. Second, one or more covariate/s are added to the model to examine their direct effects on the factors and selected indicators. Population heterogeneity exists when a significant direct effect of the covariate on the factor exists. Measurement variance is present when a significant direct effect of the covariate on an indicator of a factor is present; more specifically, when the factor is held constant, the means of the indicator are different at different levels of the covariate, indicating the presence of differential item (indicator) functioning. Modification indices were examined as one source of information in developing the models to be tested. Model fit was evaluated using established recommendations based on prior research (Brown 2015; Hu & Bentler 1999). Cut-off criteria for goodness of fit statistics included root mean squared error of approximation (RMSEA;  $< 0.06$ ), comparative fit index (CFI;  $> 0.95$ ), and standardised root mean square residual (SRMR;  $< 0.08$ ). The Chi square difference test was also used to compare competing models.

## Results

To test whether parental report of children's anxiety was different in the two groups, MIMIC modelling was applied using group (Anxiety versus ASD) as the covariate (independent variable). Analysis for the current study involved three steps. As suggested in Brown's model (2015), modification indices at each step were examined before moving on to the following step. First, a baseline model (Model 1) of 6 factors and 38 items with regression of group variable to latent factors set at zero was fit. This model assumed no difference between the Anxious and ASD groups in parental responding on the SCAS-P. Second (Model 2), modification indices for the regression of group (Anxious, ASD) on subscale were examined to test whether a difference between the Anxious and ASD groups existed at the factor (subscale) level and if so, where such differences lie. Finally (Model 3), modification indices for the regression of group (Anxious, ASD) on the individual items of the SCAS-P were examined to identify whether differences also lie at the item level and which items specifically function differently between the two groups under investigation. In Model 3, we decided to examine the relationship between item and subscale scores as these scores are clinically more useful than the Total SCAS-P Score. Table 2 presents a summary of model fit for the three MIMIC models described above.

Our data indicated evidence for ASD impacting on three of the six factors on the SCAS-P; that is Physical Injury Fears, Obsessive Compulsive Disorder (OCD) and Generalised Anxiety but not Social Phobia, Panic/Agoraphobia or Separation Anxiety. This means that responses on the SCAS-P items from a parent of a child with ASD compared to a parent of a child with anxiety, without ASD would be different when these parents have the same estimated level on the latent variable.

At the item level, variance was found in eleven of the thirty-eight SCAS-P items (Table 3); that is, items functioned differently across the two groups investigated. In most of these eleven items, ASD was associated with higher regression coefficients for the interaction between the item and group predicting the factor score. Item number 12 (*'suddenly feeling unable to breathe when there is no reason for this'*) was an exception, producing a lower regression coefficient (-0.143). Further analysis enabled us to localise differences between the eleven items that were functioning differently across the two groups. More specifically, the following five items produced a negative slope - item 2 (*'scared of the dark'*,  $z$  value = -1.982), item 3 (*'funny feeling in tummy'*,  $z$  value = -2.538), item 12 (*'suddenly feeling unable to breathe when there is no reason for this'*,  $z$  value = -2.144), item 15 (*'trouble going to school in the mornings due to feeling nervous or afraid'*,  $z$  value = -2.190) and item 24 (*'think special thoughts to stop bad things'*,  $z$  value = -1.687). This indicated that responses on these five items had a different relationship to their respective factor score for parents of children with ASD compared to those without ASD. As item 3 was the only item within the Generalised Anxiety factor that functioned differently across the Anxious and ASD groups, we cannot assume that this subscale as a whole is variant. As such, we can conclude that the two subscales performing differently across the Anxious and ASD groups are Physical Injury Fears and OCD.

## Discussion

Findings from the present study indicate that the factor structure of the SCAS-P is not identical in groups of young people with Anxiety (non-ASD) and ASD (with and without anxiety). Results from our study indicate that parental responses to items on the SCAS-P are different between the Anxious and ASD groups and as such, parts of the SCAS-P cannot be interpreted in the same way in an ASD population compared to typically developing children with anxiety. We posit two reasons that could explain this difference. Firstly, differences in the



underlying construct (anxiety) may be present across anxious and ASD childhood populations. As Kerns et al. (2014, 2016) suggested distinctions between ‘traditional’ and ‘atypical’ anxiety in ASD may exist. Secondly, a difference in parental responding may be due to the different relations between latent constructs and scores in the two groups; that is, measurement differences alone or measurement differences in addition to differences in the presentation of anxiety in anxious and ASD groups of young people.

Our findings indicate that anxiety related to Physical Injury fears, Obsessive Compulsive symptoms and Generalised Anxiety presents differently in children who also have a diagnosis of ASD. By using MIMIC, we were able to identify that differences exist in the relationship between SCAS-P items and factors across the Anxious and ASD groups. More specifically, the items listed in Table 3 were shown to be impacted by the presence of ASD and therefore perform differently in the Anxious versus ASD groups.

On closer analysis of the eleven items identified as variant across the ASD and Anxious groups, it is possible that ASD characteristics could be contributing to a child’s distress beyond what could be explained by symptoms of an anxiety disorder alone or in a way that would present similarly to symptoms of anxiety despite the different source (anxiety related to ASD symptomatology versus symptoms of an anxiety disorder). A ‘fear of crowded places’ (item 27) and ‘using public toilets or bathrooms’ (item 7), items found within the Panic/Agoraphobia and Social Anxiety subscales respectively on the SCAS-P, could be explained by distress related to sensory sensitivities typical of an ASD presentation. Excessive worry around changes in the environment and changes in schedules are also commonly found in children with ASD and thus, difficulty coping with environmental and routine changes may be impacting on SCAS-P items such as ‘difficulty going to school in the mornings due to feeling nervous or afraid’ (item 15)

and ‘fear of staying away from home overnight’ (item 38), both problematic items found within the Separation Anxiety subscale of the SCAS-P. Fears related to perseverative, obsessive and restricted characteristics of ASD which are well documented in the literature (e.g. Ozsivadjian, 2012; Leyfer et al., 2006) may explain ASD having an impact on the SCAS-P items targeting ‘compulsions around thinking special thoughts’ (item 24) and the ‘need to do things over and over again’ (item 35). Both items are found within the Obsessive-Compulsive Disorder (OCD) SCAS-P subscale however, it is difficult to discern whether such behaviours are aimed at reducing distress or preventing a feared event or situation from occurring (as is required for a diagnosis of OCD) or whether these behaviours are purely ASD related in the absence of clinical anxiety. The remaining five SCAS-P items identified as variant address ‘fear of the dark’ (item 2), ‘funny feeling in stomach’ (item 3), ‘fear that something awful will happen in the child’s family’ (item 11), ‘suddenly feeling unable to breathe when there is no reason for this’ (item 12) and a ‘fear of insects and spiders’ (item 29). These items seem to be more directly linked to anxiety disorders symptomatology compared to the other six items discussed above, where ASD symptoms appeared to have a bigger part in explaining variance obtained on analysis.

It must be noted that parental report is limited by the fact that it is a judgment or interpretation of a child’s behaviour. The fact that children with ASD present with communication difficulties and limited insight into internal states such as anxiety influences on parents’ responses of items on the SCAS-P. It is unclear whether a difference exists between parental judgment of a child’s seemingly anxious behaviour across parents of children with anxiety and parents of children with ASD.

The present study indicates that results obtained on the SCAS-P need to be interpreted with caution. We agree with Glod et al. (2017) in encouraging researchers and clinicians not to

rely solely on SCAS-P scores when assessing anxiety symptoms in individuals with ASD. More specifically, interpretation of SCAS-P subscale results as well as individual responses on SCAS-P items identified as variant need to be carefully considered before any conclusions are drawn. In clinical practice, parents of children and youth with ASD often report that some of the items on the SCAS-P do not accurately reflect anxious behaviours observed by parents and adults working closely with the young person with ASD. We suggest that responses on the eleven items identified as variant across the Anxious (non-ASD) and ASD groups be discussed with the parents or caregivers to allow them the opportunity to elaborate on their responses as needed. Such discussions would allow for more accurate clinical formulations of the child's presenting problems and consequently more effective treatment plans.

Magiati et al. (2017) recommended that the SCAS-P total score be used as a general screen for anxiety rather than relying on results on the separate subscales. We agree with this recommendation and further caution against generalisability of results obtained on the two variant subscales (Physical Injury Fears, Obsessive Compulsive Disorder) and the eleven individual items (see Table 3) which, based on our findings, were impacted by the presence of ASD.

### **Limitations and Future Research**

Our study was limited by a relatively small ASD sample. Whilst aware that categorical invariance (as would have been the case in using Multi-Group Confirmatory Factor Analysis) may have yielded more accurate results, due to our small ASD sample, use of partial metric invariance using MIMIC was necessary. That is, we assumed equal distances between the anchor points on SCAS-P. Information regarding cognitive ability of the children and adolescents in our sample was not available, making it difficult to draw conclusions around

whether our findings hold for young people with ASD across different levels of functioning. ASD diagnoses for the children in the ASD group were based on community assessments or through screening using the Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent versions (ADIS-IV-C/P; Silverman and Albano, 1996) and the structured clinical interview - The Asperger Syndrome (and high-functioning autism) Diagnostic Interview (ASDI, Gillberg, Gillberg, Rastam & Wentz, 2001). A lack of consistency in the assessment process poses a limitation in our findings.

Another limitation is the fact that we set out to conduct our analysis by assuming that the original six correlated-factor structure provided a good fit of the data (Spence, 1997). Confirmatory factor analyses of the SCAS-P conducted recently (Glod et al, 2017 and Jitlina et al., 2017) did not support this factor structure, posing a limitation to our findings. Finally, having used secondary and archival data meant that pre-existing differences in our groups could not be completely eliminated and as such, we cannot be sure that the differences obtained across the Anxious and ASD groups in our study are not simply due to pre-existing differences between the two groups as opposed to real differences in the latent construct.

The present study contributed to further psychometric evaluation of the SCAS-P in ASD by using a sample of children and adolescents with confirmed diagnoses of anxiety disorders. Using MIMIC, we determined lack of generalisability of the use of the SCAS-P as it currently stands, in measuring anxiety in young people with ASD. This psychometric study identified that three of the six individual subscales, namely Social Anxiety, Separation Anxiety and Panic/Agoraphobia subscales are better suited for examining anxiety symptoms as rated on the SCAS-P in children and youth with ASD.

In view of our findings, questions regarding anxiety mechanisms in the ASD population remain. More suitable assessment measures to assess anxiety in children and adolescents with ASD need to be developed to further our understanding about anxiety as a comorbid, separate or atypical form of anxiety in the ASD population. As emotional insight and communication challenges are inherent to ASD, it is necessary that future revisions of the SCAS-P or newly developed anxiety measures for individuals with ASD focus on minimizing the cognitive aspect of assessment items, placing a heavier focus on the more concrete and observable behaviours that are indicative of anxiety in children and youth. It is expected that a more accurate parental report of childhood anxiety can be obtained if parents are not required to interpret their children's behaviour or are required to do so to a lesser extent.

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**Table 1.** *Demographic data and diagnoses*

Demographic <sup>a</sup>	Anxious Sample N = 319	ASD Sample N = 107	Full Sample N = 426
Child gender			
% Male	74.6	74.8	74.6
% Female	25.4	25.2	25.4
Child age (years)	M = 11.28 SD = 2.91	M = 11.30 SD = 3.00	M = 11.29 SD = 2.93
Ethnicity <sup>b</sup>			
% Australian, Oceanic, Caucasian	95.2	94.3	94.9
% Asian	4.8	5.7	5.1
Family type <sup>c</sup>			
% Two-parent	79.6	84.1	80.4
% Single-parent	14.7	7.9	13.6
% Step/Blended/Other	5.6	7.9	6.0
Family home language <sup>d</sup>			
% English	96.1	99.1	97.0
% Other	3.9	0.9	3.0
Family income <sup>e</sup>			
% Low Income	23.9	3.2	20.5
% Normal Income	76.1	96.8	79.5
Primary diagnosis (%)			
Generalised Anxiety Disorder	40.1	4.7	31.2
Social Phobia	20.7	-	15.5
Separation Anxiety Disorder	13.8	1.9	10.8
Specific Phobia	6.8	1.8	5.6
Panic Disorder	1.9	-	1.4
Obsessive Compulsive Disorder	8.5	0.9	6.6
Autistic Disorder	-	46.7	11.7
Asperger's Syndrome	-	30.8	7.7
PDD-NOS	-	8.4	2.1
Other Mental Health Conditions	8.2	4.6	7.3

*Note.* PDD-NOS = Pervasive Developmental Disorder - Not Otherwise Specified. ASD = Autism Spectrum Disorder. Other Mental Health Conditions/Psychological Problems include Major Depressive Disorder, Attention Deficit/Hyperactivity Disorder, Oppositional Defiant Disorder, Enuresis.

<sup>a</sup>Valid percent used to describe demographic data.

Missing Data- Anxious Group: <sup>b</sup>Ethnicity = 28.8%, <sup>d</sup>Family home language = 27.9%, <sup>e</sup>Family income = 1.6%. ASD Group: <sup>b</sup>Ethnicity = 0.9%, <sup>c</sup>Family Type = 41.1%, <sup>d</sup>Family home language = 0.9%, <sup>e</sup>Family income = 42.1%. Full Sample: <sup>a</sup>Ethnicity = 21.8%, <sup>b</sup>Family Type = 10.3%, <sup>c</sup>Family home language = 21.1%, <sup>d</sup>Family income = 11.7%.



**Table 2.** *Summary of model fit for MIMIC models*

Model	Model Description	$\chi^2$	df	RMSEA	90% CI	CFI	SRMR	Model Comparison	$\chi^2$ difference
Model 1	Six Factor	2568.241	68 8	0.080	0.077 0.083	0.670	0.093	-	-
Model 2	Group to Subscale Regression	2527.168	68 5	0.079	0.076 0.083	0.677	0.091	1 vs. 2	41.073 (df = 3) p = sig
Model 3	Group to Subscale and Item Regression	2441.781	67 4	0.078	0.075 0.082	0.690	0.090	2 vs. 3	85.387 (df = 11) p = sig

*Note.* RMSEA = root mean squared error of approximation; CFI = comparative fit index; SRMR = standardised root mean square residual. Recommended goodness of fit indices values demonstrating good model fit: RMSEA <0.06, CFI >0.95 and SRMR <0.08 (Brown 2015; Hu and Bentler 1999).

**Table 3.** *Effect of group (Anxiety/ASD) at individual items level*  
*Differences between the 11 SCAS-P items of note identified in Model 3 (Table 2)*

SCAS-P Item no.	Item Descriptor	Subscale	Estimate	Std. Err	z- value	P(> z )
2	... scared of the dark	PIF	0.368	0.186	-1.982	0.047
3	... funny feeling in stomach	GAD	0.277	0.109	-2.538	0.011
7	... use public toilets or bathrooms	SOC	0.236	0.101	2.331	0.020
11	... something awful will happen to someone in our family	SEP	0.183	0.099	1.858	0.063
12	... suddenly feeling unable to breathe when there is no reason for this	PAG	-0.143	0.067	-2.144	0.032
15	... trouble going to school in the mornings due to feeling nervous or afraid	SEP	0.262	0.120	-2.190	0.029
24	... think special thoughts to stop bad things	OCD	0.118	0.070	-1.687	0.092
27	... afraid of being in crowded places	PAG	0.586	0.101	5.812	0.000
29	... scared of insects or spiders	PIF	0.200	0.138	1.445	0.148
35	... has to do some things over and over again	OCD	0.212	0.086	2.449	0.014
38	... scared of staying away from home overnight	SEP	0.204	0.096	2.115	0.034

*Note.* PIF = Physical injury fears; GAD = Generalized anxiety disorder; SOC = Social phobia; SEP = Separation anxiety; PAG = Panic attack and agoraphobia; OCD = Obsessive Compulsive Disorder

### **Chapter 3**

**Development of the Macquarie Anxiety Behavioural Scale (MABS): A parent measure to  
assess anxiety in children and adolescents including young people with  
Autism Spectrum Disorder**

**Development of the Macquarie Anxiety Behavioural  
Scale (MABS): A Parent Measure to assess anxiety in  
children and adolescents including young people with  
Autism Spectrum Disorder**

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## Abstract

**Objective:** The purpose of this study was threefold. First, we attempted to replicate the findings of measurement variance for Autism Spectrum Disorder (ASD) in the Spence Children's Anxiety Scale - Parent Form (SCAS-P; Spence, 1999) in a new sample comprised of parents of children with and without ASD. Second, we developed and evaluated a new parent report measure for anxiety in clinical and non-clinical populations of children and youth. The newly developed measure, the Macquarie Anxiety Behavioural Scale (MABS) focuses on observable cognitive, behavioural and physiological symptoms of anxiety in children and adolescents. Third, we assessed the utility of the SCAS-P and the MABS across a group of children with and without ASD. The measurement invariance of the SCAS-P and the MABS was assessed to determine the performance of these two measures in an ASD population. **Method:** A sample of 734 parents was recruited. Participants included parents of children aged 3-19 years (i) who were seeking help for their child's anxiety, (ii) who had received a prior diagnosis of ASD (some of whom were also seeking help for anxiety), or (iii) from the general community. A confirmatory factor-analytic approach was used to establish the factor structure of the MABS. MIMIC modelling was utilised to assess measurement invariance of the SCAS-P and the MABS. **Results:** As in the original (Toscano et al., 2017) study, evidence for measurement variance of the SCAS-P was found. Confirmatory factor analysis of the MABS showed that a five correlated DSM-factor model with correlated errors provided an optimal fit for the data. Measurement variance was also found for the MABS, revealing different factor structures between the ASD and non-ASD groups. MIMIC modelling showed that all six SCAS-P subscales and all five MABS subscales performed significantly different across the ASD and non-ASD groups that were investigated. Differential item functioning on a number of the SCAS-P and MABS items was also found. **Conclusion:** The newly developed MABS is a new parent measure to

assess anxiety in children and adolescents. The proposed factor structure of the MABS produced a reasonably good fit for the data in this study. Similar to the SCAS-P, ASD was found to impact on some of the MABS items indicating that the presence of ASD influences parental responding on the new measure. Sixteen MABS items showed measurement invariance across the anxious and ASD groups and can be considered suitable items for the assessment of anxiety in ASD. Ideas for further development of the MABS for use in children with and without ASD are presented and encouraged.

*Keywords:* Anxiety, Autism Spectrum Disorder (ASD), Assessment, Children, Adolescents

## **Development of the Macquarie Anxiety Behavioural Scale (MABS):**

### **A Parent Measure to assess anxiety in children and adolescents including young people with Autism Spectrum Disorder**

Anxiety disorders are among the most frequently reported psychiatric disorders in children and adolescents (e.g. Costello, Mustillo, Erkanli, Keeper, & Angold, 2003; Ford, Goodman, & Meltzer, 2003; Merikangas, Nakamura, & Kessler, 2009). A report on the Second Australian Child and Adolescent Survey of Mental Health and Wellbeing indicated that anxiety disorders were the second most common mental disorder in children and adolescents aged 4-17 years old (Lawrence, Johnson, Hafekost, Boterhoven de Haan, Sawyer, Ainley, & Zubrick, 2015). Anxiety disorders have also been identified as the most common psychiatric comorbidities seen in young people with Autism Spectrum Disorder (ASD; White, Oswald, Ollendick, & Scahill, 2009), affecting about 40% of children and adolescents with ASD (van Steensel, Bögels, & Perrin, 2011). High prevalence of anxiety disorders in children and moderate life impact (Rapee, Schniering, & Hudson, 2009) highlight the importance of having reliable and valid assessment tools for accurate identification and treatment of anxiety disorders in young people.

Over the past decade, numerous attempts have been made to improve the way we assess, understand and treat anxiety in children and adolescents with ASD. Kerns and Kendall (2012) suggested that to determine the role of anxiety in ASD, the quality of assessment measures used in future research should be carefully considered. To our knowledge, only one ASD-specific anxiety measure has been developed to date, namely the freely available Anxiety Scale for Children - ASD, Parent and Child versions (ASC-ASD; Rodgers, Wigham, McConachie, Freeston, Honey, & Parr,



2016). The ASC-ASD has shown promising psychometric properties; further investigation is required to confirm the stability and robustness of the measure. In a recent study by Magiati et al. (2017), measurement properties of the Spence Children's Anxiety Scale-Parent Version (SCAS-P; Spence, 1999) in a large international sample of young people with ASD were assessed. Confirmatory Factor Analysis (CFA) revealed a poor fit for the six-correlated factor structure. Furthermore, Magiati et al. (2017) compiled a summary of caregiver reported measures of anxiety developed for typically developing youth which indicated that a consistent anxiety factor structure in ASD is yet to be determined.

A lack of consensus on how anxiety disorders are diagnosed in young people with ASD (Kerns & Kendall, 2012) has seen a steady increase in attempts to determine the factor structure of anxiety in ASD. Diagnostic overlap between anxiety and ASD has been cited in the literature (Drabick & Kendall, 2010; Kerns, Renno, Kendall, Wood, & Storch, 2016), implying that the two conditions (anxiety and ASD) are comorbid or co-occur. Kerns and Kendall (2012) explain that despite some similarity, true comorbidity relies on reliable differentiation between two co-occurring disorders and that a lack of differentiation could give rise to co-occurrence that is the result of poor differential diagnosis. A number of studies have attempted to answer questions related to comorbidity and overlapping symptoms of anxiety by comparing typically developing children with those with ASD (e.g. Cath, Ran, Smit, Van Balkom, & Comijs, 2008; Gadow, DeVincent, Pomeroy, & Azizian, 2005; Hartley & Sikora, 2009), however, clarity around the presentation of anxiety in young people with ASD currently remains.

The assessment of anxiety in ASD has also received a lot of attention recently as the majority of measures currently used to assess for anxiety are not validated for children and

adolescents with ASD (Storch et al., 2012). Some studies have provided suggestions on ways to improve the assessment of anxiety in ASD. For example, it was suggested that current measures that assess anxiety could be modified or adapted for the ASD population or that ASD-specific anxiety measures be developed (Kerns, Maddox, Kendall, Rump, Berry, Schultz, & Souders, 2015; Sterling, Renno, Storch, Ehrenreich-May, Lewin, Arnold, & Wood, 2015). One consideration when assessing suitability of anxiety measures for children and adolescents is parent-child agreement. Some studies have reported stronger parent-child agreement on symptoms of Separation Anxiety and Social Anxiety (Blakeley-Smith, Reaven, Ridge, & Hepburn, 2012; Ooi, Weng, Magiati, Ang, Goh, Fung, & Sung, 2016). One possible suggestion put forward by Ooi et al. (2016) for higher agreement on these subscales is the fact that separation and social fears are more clearly observable behaviours (e.g., apparent avoidance or clingy behaviour) compared to internal thoughts that lack observable accompanying avoidance behaviors such as symptoms related to generalised anxiety. Unless a child is able to verbally articulate inner worries, parents are often required to interpret their children's behaviour to determine whether or not a stimulus, event or situation elicits anxiety for their child. Particularly for children and youth with ASD, parents may not always be aware of some of the anxiety symptoms exhibited by their children or their severity and frequency (Glod, Creswell, Waite, Jamieson, McConachie, South, & Rodgers, 2017). Inherent ASD-related traits including poor insight, impaired affect recognition, communication difficulties, and rigidity in thinking exacerbate challenges associated with accurate identification of anxiety in ASD (e.g. Lickel, MacLean, Blakeley-Smith, & Hepburn, 2012). It is therefore not surprising that Ooi et al. (2016) found higher parent-child agreement for anxiety symptoms associated with clearly observable behaviours in children with autism.

One of the anxiety measures routinely used in Australia is the Spence Children's Anxiety

Scale (SCAS-C; Spence, 1998) and its corresponding parent/care-giver version (SCAS-P; Spence, 1999). The SCAS-P is a 38-item questionnaire used in clinical practice and research to assess and measure anxiety symptoms in young people with and without ASD (e.g. Chalfant, Rapee and Carroll, 2007; McConachie et al., 2014; Rodgers, Riby, Janes, Connolly, & McConachie, 2012; Sung et al., 2011). Parents or care-givers are asked to complete the measure to assess the severity of a range of anxiety symptoms in children aged 6–18 years. The SCAS-P was designed to assess children’s symptoms of anxiety along the structure of the Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM-IV-TR; American Psychiatric Association, 2000). Despite having sound psychometric properties in typically developing children (Nauta et al., 2004), a recent study which assessed measurement invariance of the SCAS-P across a group of children with anxiety disorders and ASD found evidence for measurement variance across the two groups both at the subscale and item levels indicating differential functioning of the SCAS-P across the groups of children assessed (Toscano, Hudson, Baillie, Lyneham, Kelly, & Kidd, 2017).

In light of Ooi’s (2016) comments about items related to observable behaviours yielding higher parent-child agreement in the assessment of anxiety in children with ASD, it appears that one of the possible difficulties with the use of the SCAS-P in children and adolescents with ASD is a lack of items focusing on clearly behavioural and observable anxiety symptoms. Nauta, Scholing, Rapee, Abbott, Spence, & Waters (2004) noted that in formulating SCAS-P (Spence, 1999) items to correspond with items in the child version of the SCAS (SCAS-C; Spence, 1998), items referring to a child’s internal emotional state (for example, item 4 which focuses on a child ‘feeling afraid’) were reworded to reflect observable behaviour for parents (“My child complains of feeling afraid”). We note however that not all items on the SCAS-P address clearly behavioural and observable anxiety symptoms (for example item 1 – “My child worries about things”). Furthermore, anxiety in

minimally verbal individuals with ASD is commonly apparent through problem behaviours (Cohen, Yoo, Goodwin, & Moskowitz et al. 2011; Moskowitz, Mulder, Walsh, McLaughlin, Zarcone, Proudfit, & Carr, 2013), which are not captured by the SCAS-P subscales.

The present study aimed to address measurement variance found in the SCAS-P (Toscano et al., 2017) by developing an improved parent measure to assess anxiety in children and adolescents that is suitable for young people with and without ASD. Attempts to address suggestions put forward by prior research were taken into consideration during the developmental phase of our new measure. The Macquarie Anxiety Behavioural Scale (MABS) was designed to be consistent with Diagnosis and Statistical Manual of Mental Disorders (5th ed., DSM-V; APA, 2013) anxiety categories. Items were selected and further developed based on an extensive review of the literature, existing measures, and interviews with numerous clinicians and professionals working in the fields and anxiety and ASD. To address challenges related in the identification and expression of anxiety in young people with ASD, the newly developed measure aimed to focus on more observable physiological, cognitive and behavioural indicators of anxiety and to reduce the cognitive component in the individual items that form part of the parent measure. We also aimed to develop a measure that assesses anxiety that is separate to ASD symptomatology. In view of communication and emotion recognition difficulties in the ASD population as described earlier, we focused on development of a parent measure of anxiety rather than a self-report measure.

The aims of the current study were threefold. Firstly, we attempted to replicate a study by Toscano et al. (2017) which found evidence of measurement variance for the SCAS-P. We assessed whether similar findings still hold when using a different sample. The original study utilised a sample of parents of children and adolescents with anxiety and children with ASD (with and

without anxiety). The present study utilised a sample of parents of children and adolescents with ASD and children without ASD (anxious and community sample). Secondly, we developed a new parent measure of anxiety (the MABS) that is suitable for clinical and community populations of young people including children with ASD. We also determined the factor structure of the MABS in a sample of young people and ensured adequate fit for the data to consider invariance. Thirdly, measurement invariance techniques were utilised to determine whether the MABS and its items function in the same way in children with and without ASD (who may or may not also have an anxiety disorder). Multiple indicator multiple cause (MIMIC) structural equation modelling was utilized to analyse the data and test for measurement invariance across the ASD group and non-ASD group. We hypothesised that on comparing the newly developed MABS with the already established SCAS-P across a group of children with and without ASD (with or without anxiety), greater measurement invariance across the two groups would be present when using the MABS; that is, the MABS will perform more similarly across the two groups than the SCAS-P and therefore be more suitable for children and adolescents with ASD.

## **Method**

### **Participants**

The sample consisted of 734 parents (715 mothers = 97.4% and 19 fathers = 2.6%) of children aged 3 to 19 years ( $M = 9.7$ ,  $SD = 3.34$ ). Whilst we originally intended to recruit parents of children aged between 6-18 years, a small group of parents of children aged 3-5 years ( $n = 23$ ) and 19 years ( $n = 6$ ) freely consented and participated in our study. These participants were included in our overall sample to allow for greater variability within our study. All parents completed formal schooling (Year 10 or above) with the majority of parents also completing further study following high school completion – 26.5% of parents obtained a Certificate/Diploma, 24.9% completed an

Undergraduate Degree and 28.3% a Postgraduate Degree. The majority of families reported earning between \$52,000-\$124,799 per year (44.3%). In regards to employment, 30.7% of parents reported staying at home by choice, 35.2% were employed on a part-time basis and 23.9% in full-time employment. The majority of children lived in two-parent households (79.2%), with their biological parents (98.1%) and mainly attended primary school (77.7%) or high school (19.9%). Parents identified primarily as Oceanic (71.8%) and English speaking (98.2%). Ethics approval to conduct the present study was obtained from Macquarie University Human Research Ethics Committee, Sydney, Australia.

Participants were recruited Australia-wide from three different groups, namely a community (control) group (429 parents = 58.4%), a clinical group seeking help for anxiety (64 parents = 8.7%) and an ASD group (parents of children with a primary diagnosis of ASD, with and without anxiety, 242 parents = 32.9%). We utilised an over-sampling strategy for the anxious and ASD groups to ensure adequate coverage for these two groups within our overall sample. Table 1 presents demographic characteristics and frequency of mental health and neurodevelopmental disorders.

The control sample was recruited via advertisements posted on online parenting groups and forums as well as via the Neuronauts Brain Science Club portal (a register for people interested in participating in research studies). A three-month long recruitment campaign via a parenting magazine to recruit additional participants for the control group was also conducted. The anxious sample was recruited from the Centre for Emotional Health Clinic (CEHC), Macquarie University, Sydney, Australia. This group consisted of parents whose children were aged 6-18 years, who sought assessment and treatment and participated in randomized clinical trials for childhood anxiety at the CEHC. Anxiety diagnoses and clinical severity ratings were assigned based on the anxiety

disorders Interview Schedule for DSM-IV, Child and Parent versions (ADIS-IV-C/P; Silverman & Albano, 1996), administered by graduate students in clinical psychology or qualified clinical psychologists. The ASD group was recruited through advertisements placed with local ASD service providers and online advertising through the Autism Spectrum Australia (ASPECT) website. Two participants within the ASD group were recruited from the CEHC, Macquarie University. These two participants presented for assessment and treatment at the CEHC.

Parents from all three groups were encouraged to complete an online questionnaire if they had a child who met any of the following criteria: a child with or without emotional or developmental problems; a child who struggles with fears, worries and anxiety; a child who has an Autism Spectrum Disorder (who may or may not also struggle with anxiety). Children with a diagnosis of an anxiety disorder or ASD (with or without anxiety) appearing anywhere in the child's profile were included in the study. Separate web addresses were provided to the Community and ASD groups for online questionnaire completion. The online questionnaire for the anxious group and the two participants with ASD who were recruited from the recruited from the CEHC, Macquarie University, was incorporated within a larger assessment battery that families receiving assessment and treatment through the CEHC complete during one of their initial appointments at the clinic.

Participating parents were allocated to the ASD group if their children met both of the following criteria: (i) had a parent reported community acquired diagnosis of ASD and (ii) met or exceeded total score cut offs on the Autism Spectrum Rating Scales (ASRS; Goldstein & Naglieri, 2010, *see description below*) as per instructions in the ASRS manual, that is a T-score of  $\geq 60$ . A total of 257 participants formed the ASD group. Participants who did not meet either of these

criteria ( $n = 330$ ) formed the non-ASD group whilst the remaining participants who only met one of these two criteria ( $n = 147$ ) were excluded from further analyses. Data from the final subgroup of participants ( $n = 587$ ) as defined above were utilised to test measurement invariance of the SCAS-P and the MABS across parents of children in the ASD group versus parents of children in the non-ASD group (control and clinical group, with and without anxiety). Children with comorbid conditions such as Attention Deficit/Hyperactivity Disorder or Depression were not excluded from the study due to the high prevalence of comorbid conditions in ASD (e.g. Ozonoff and Rogers, 2003). Parents were excluded from this study if they did not understand and speak English fluently.

## **Measures**

### **Spence Children's Anxiety Scale – Parent Report**

The Spence Children's Anxiety Scale for Parents (SCAS-P; Spence, 1999) was used to evaluate parent-reported symptoms of a child's anxiety and to establish convergent validity with the newly developed MABS. The SCAS-P was formulated closely to its corresponding self-report form – the SCAS-C (Spence, 1998), which was developed to assess anxiety symptoms in children in the general population. The SCAS-P consists of 38 items that assess child anxiety symptoms across six domains: separation anxiety, generalized anxiety, social phobia, panic/agoraphobia, obsessive-compulsive disorder, and fear of physical injuries. For each item, parents or caregivers select the response that best describes how often their child experiences a given feeling, thought, or behaviour. Items are scored from 0 (never) to 3 (always). The SCAS-P is commonly used for clinical and research purposes. It has good psychometric properties (Nauta et al., 2004); reliability coefficients of the subscales are satisfactory to excellent (0.81 to 0.90 in the normal control group and from 0.83 to 0.92 in the clinical group) and it also demonstrates convergent and divergent validity. The SCAS-P correlated strongly and significantly with the Child Behavior Checklist



(CBCL; Achenbach, 1991) internalizing subscale (0.55 in the clinical group, 0.59 in the control group) and significantly, but at a lower level, with the CBCL-externalizing subscale (0.33 in the anxiety disordered group, 0.34 in the normal control group).

### **Strengths and Difficulties Questionnaire – Parent Report**

The Strengths and Difficulties Questionnaire – Parent Form (SDQ-P; Goodman, 1997) is a brief behavioural screening measure that was used to assess externalising behaviour. The SDQ comprises 5 scales of 5 items each (25 items total), namely the Emotional Symptoms Scale, Conduct Problems Scale, Hyperactivity Scale, Peer Problems Scale and Prosocial Scale. In the current study, the SDQ was used as a reliable tool to establish divergent validity with the MABS. Reliability of the SDQ has been reported as satisfactory (internal consistency - mean Cronbach's alpha: 0.73, cross-informant correlation - mean: 0.34, and retest stability after 4 to 6 months - mean: 0.62). SDQ scores above the 90th percentile predicted a substantially raised probability of independently diagnosed psychiatric disorders (mean odds ratio: 15.7 for parent scales) (Goodman, 2001).

### **Short Mood and Feelings Questionnaire – Parent Report**

The Short Mood and Feelings Questionnaire - Parent Form (SMFQ-P; Angold, Costello, Messer, Pickles, Winder, & Silver, 1995) consists of 13 items used to assess child depressive symptoms. Each item asks parents to rate whether the provided item is indicative of their child's feelings and actions ("Not True", "Sometimes", or "True") over the timeframe of the previous two weeks. The SMFQ-P has shown good internal consistency in parent-reports (Cronbach's alpha = 0.87) and sensitivity and specificity of 0.78 (Angold, Costello, Messer, Pickles, Winder, & Silver,

1995; Wood, Kroll, Moore, & Harrington, 1995). The SMFQ-P was used in our study to establish divergent validity.

### **Autism Spectrum Rating Scales**

The Autism Spectrum Rating Scales (ASRS) was developed as a screen for ASD. It is comprised of 71 items based on DSM-IV-TR (APA, 2000) symptom criteria and designed to identify symptoms, behaviors, and associated features of ASD in children (Goldstein & Naglieri, 2010). The ASRS has good to excellent psychometrics properties (e.g. internal consistency: 0.85–0.98, inter-rater reliability—parents: 0.73–0.92, test–retest reliability: 0.72–0.93, and sensitivity and specificity 0.90–0.92) in ASD versus general population. When completing the ASRS, caregivers indicate how often their child demonstrated a specific behaviour over the previous four weeks; items are scored as 0 (never), 1 (rarely), 2 (occasionally), 3 (frequently), or 4 (very frequently). In the present study, the ASRS was used to establish divergent validity, identify ASD-related symptoms and behaviours as well as determine participant allocation to the ASD group based on a T-score of  $\geq 60$  (more information about participant allocation to the ASD group will be provided later in this paper).

### **Scale Development – Macquarie Anxiety Behavioural Scale (MABS)**

We set out to develop a new parent measure that fit the following design specifications: (i) included a set of items that covered a range of response types provided by all parents that completed the measure (avoiding floor and ceiling effects), (ii) a total number of items that would make the measure clinically useful (approximately the same number of items as the SCAS-P), (iii) a measure that is disorder specific in line with anxiety disorders as per DSM-V (APA, 2013) and (iv) a measure that assesses anxiety that is not confounded by ASD symptomatology and traits.

An initial pool of 56 items was generated based on a review of literature related to anxiety, ASD and the presentation of anxiety in ASD; interviews with 3 professionals who routinely work with children and adolescents with ASD and by adapting items from the ADIS-IV-C/P (Silverman and Albano, 1996) and other already established measures of anxiety such as the SCAS-P (Spence, 1999). Adaptation of items was necessary to reflect observable behaviours that represent underlying anxiety. For example, the SCAS-P items ‘My child is scared of dogs’ and ‘My child is scared of insects and spiders’ were combined and adapted to ‘My child refused to be around certain animals or insects (e.g. dogs, spiders)’. In this case, ‘refusal’ is considered the more clearly observable behaviour to reflect the child’s fear (‘feeling scared’) as assumed or interpreted by the parent or caregiver. Unlike ‘refusal’, ‘feeling scared’ is an internal cognitive experience which, as described earlier, would result in parental difficulty estimating frequency of the worry being assessed. Novel items such as ‘My child asked many questions about new situations’, ‘My child talked about the worst thing that might happen in a situation’ and ‘My child spent more time or effort than was needed preparing for activities (e.g. took extra pencils to an exam, studied constantly, practiced over and over, checked school bag was packed correctly)’, were also generated. Of note are the additional examples provided in some of the items that form part of the new measure to further assist caregivers in identifying relevant situations experienced by their child. We anticipated that these changes and inclusion of new items would allow for the assessment of anxiety based on clearly observable behaviours which in turn produces an improved measure of anxiety that demonstrates invariance across children with and without ASD.

Next, expert feedback on the revised set of items from clinicians who regularly work with young people with anxiety and ASD was gathered in two different stages. At stage one, we requested written feedback from six clinicians. At stage two, feedback from a group of ten

clinicians was obtained via an online questionnaire using Qualtrics software (2017). Clinicians were asked to review and provide feedback on the preliminary items that would form part of the new measure prior to pilot testing. Additional information about clinical aspects of anxiety and ASD behaviour as it presents in children and adolescents as well as feedback on comprehension and wording of items was also requested. All feedback obtained was reviewed, item readability assessed using the Gunning Fog Index (Gunning, 1944) to ensure a suitable readability level for all parents and items selected, edited or discarded based on 75% clinician agreement and a mean of 3.5 on best fit (1 = very poor fit, 5 = very good fit) for both anxiety type and observable symptoms (cognitive, behavioural or physiological). Additional items were also developed to further reflect feedback obtained and to ensure sufficient coverage across different anxiety symptoms in line with DSM-V anxiety disorders diagnostic criteria (APA, 2013).

Glod et al. (2017) suggested that in order to better understand the context upon which caregivers base their answers when answering parent measures, qualitative interviews should be conducted. As such, we then pilot tested the items that had been developed up to this stage, with a small group of parents (3 parents of children with anxiety and 3 parents of children with ASD, with and without anxiety) through face-to-face interviews conducted at the Centre for Emotional Health Clinic (CEHC), Macquarie University. Parent interviews were intended to assess comprehension of items and establish alternate wording as needed. Feedback was again used to make final edits to our set of items and the pilot measure consisting of 57 items prepared for online data collection. A survey battery including demographic questions, the parent measures listed above and the new pilot measure was compiled and distributed to parents across Australia.

Once all data were collected, items were screened for similarities and differences in the overall distribution of responses across the three different groups. Using Spearman's Rho, Item Total Correlations (ITC), convergence with the SCAS-P and divergence with the ASRS, SMFQ-P and SDQ-P were analysed. Further reduction in the item pool in line with our design specification was conducted; items were retained or dropped based on convergent and divergent validity and internal consistency. The final item set consisted of 23 anxiety related questions covering all anxiety disorders except for Selective Mutism. Throughout the development phase, items corresponding to Selective Mutism diagnostic criteria as per DSM-V (APA, 2013) were developed, however, initial analysis revealed high correlation with the ASRS indicating potential overlap with ASD traits. As such, we were unable to put Selective Mutism-related items forward for further analysis; these items were excluded from our parent measure. The measure was named the Macquarie Anxiety Behavioural Scale (MABS). Table 2 provides a list of the final set of items that form the MABS.

## **Statistical Analysis**

### **Stage 1: Establishing factor structure of the MABS**

To examine the factor structure of the MABS, confirmatory factor analysis (CFA) was conducted using the software package Lavaan (versions 0.5.18 to 0.5.22, Rosseel, 2012) in open source software R (R Core Team, 2012). No data was missing for responses on the MABS. CFA testing different factorial structures was utilised to confirm a simple factor structure of the newly developed parent measure. CFA was chosen over exploratory factor analysis as a factor structure that was in line with DSM-V (APA, 2013) anxiety disorders diagnostic criteria (as outlined in the MABS scale development section above) was central to the MABS throughout the development phase. Using our data set, we tested model fits for five model options based on hypotheses derived from previous research in anxiety and ASD. The five models tested were as follows: One Factor,

two factor - Distress and Fear, five correlated factors based on DSM, five correlated DSM Factors with correlated errors and five hierarchical DSM factors.

## **Stage 2: Multiple-Indicators-Multiple-Causes (MIMIC) Analysis**

Differences in factor structure of the SCAS-P as well as the MABS between parents of children with ASD and their counterparts without ASD (all with or without anxiety) were examined using MIMIC (multiple-indicators-multiple-causes) modelling. In view of our sample size, MIMIC modelling (also known as Confirmatory Factor Analysis with covariates) was deemed suitable to examine invariance across both groups. MIMIC modelling entails regressing the latent variables and indicators onto a covariate that represent group membership (Diagnosis: 0 = no ASD, 1 = ASD). Using MIMIC modelling, we tested whether ASD impacts the way parents answer items on the SCAS-P and the MABS and if differences were detected, we identified where such differences lay. Missing data for responses on the SCAS-P (1.1%) was managed by using maximum likelihood estimation method of data imputation.

Brown's (2015) MIMIC modelling guidelines were followed. When using MIMIC modelling, a single input matrix containing variances and covariance's of both the latent variable indicators and the covariates that denote group membership is used. The first step involves using a viable measurement model using the full sample (collapsing across groups). In our case, the full sample represents the subgroup containing parents of children with ASD and those without ASD as described earlier. Second, one or more covariate/s are added to the model to examine the direct effects of the covariate/s on the factors and selected indicators. A population can be deemed heterogeneous when a significant direct effect of the covariate on the factor is observed. Measurement variance is present when a significant direct effect of the covariate on an indicator of

a factor is present. That is, when the factor is held constant, the means of the indicator are different at different levels of the covariate, indicating differential item (indicator) functioning. Model fit was evaluated using established recommendations based on prior research (Brown 2015; Hu & Bentler 1999). Cut-off criteria for goodness of fit statistics included the comparative fit index (CFI;  $>0.95$ ), root mean squared error of approximation (RMSEA;  $<0.06$ ), and standardised root mean square residual (SRMR;  $<0.08$ ). Smaller RMSEA and SRMR values indicate a better fitting model. Nested models were compared using the Chi square difference test.

In the current study, the internal structure of the SCAS-P was assumed to be a six-correlated factor model corresponding with DSM-IV (APA, 1994) anxiety disorders (Arendt et al. 2014; Ishikawa et al. 2013; Li et al. 2011; Nauta et al. 2004). The internal structure of the MABS was based on the best fitting model identified earlier during the CFA stage (Stage 1) and described in more detail in the Results section below. MIMIC analysis for both measures in the present study (SCAS-P and MABS) involved three steps (outlined below). As suggested by Brown's model (2015), modification indices were examined at each step, before moving on to the following step.

Step 1: First, a baseline model (Model 1, Tables 4 and 5) with a specific number of factors (subscales) and total number of items per scale with regression of group variable (ASD diagnosis) to latent factor (anxiety) set at zero was fit. This model assumed no difference between the two groups under investigation, that is, no difference between the ASD and non-ASD groups. Step 2: Next (Model 2, Tables 4 and 5), modification indices for the regression of group (ASD versus non-ASD) on subscale were examined to test whether a difference between the ASD and non-ASD groups existed at the factor (subscale) level and if so, where such differences lie. Step 3: The third and final step (Model 3, Tables 4 and 5), involved examination of the modification indices for the

regression of group (ASD, non-ASD) on the individual items of the respective parent measures to identify whether differences also lie at the item level and where (if any) differential item functioning can be found. Tables 4 (SCAS-P) and 5 (MABS) present a summary of model fits for the three MIMIC models described above.

## **Results**

### **Stage 1: MABS Factor Structure**

A comparison of Confirmatory Factor Analysis (CFA) model fits for the MABS using the entire sample ( $N = 734$ ) is presented in Table 3. CFA suggested that a solution of five correlated DSM factors with correlated errors provided the best fit for the data. With every model that was tested, model fit improved until we reached Model 4 which revealed a worse fit compared to Model 3a. As such, Model 3a (five correlated DSM Factors with correlated errors) was deemed the best model for this study. We are aware of limitations surrounding the inclusion of residual correlations (e.g. Hermida, 2015), however, we believe that the covariance in the present study can be explained by the way anxiety presents in ASD, the elimination of the cognitive component in a number of the items as well as violations of local independence related to the use of complex (long) items that also include a series of examples (see Table 2 for examples). In using such items, similarity and overlap between the items is more likely, hence the inclusion of correlated errors in our best fitting model. Using this method, we were able to achieve a simple factor structure for the MABS. In light of historical and more recent debates in the literature around the structure of psychopathology (e.g. Clark & Watson, 1991; Krueger & Markon, 2006), we also tested a bi-factor model looking at the common variance across the MABS items and DSM-specific anxiety disorders. A poorer model fit was obtained when we tested the bi-factor model therefore this model was not analysed further.



## Stage 2: Multiple-Indicators-Multiple-Causes (MIMIC) Analysis

To determine whether parental report of child anxiety differed across the ASD and non-ASD groups, MIMIC modelling was applied using group (ASD versus non-ASD) as the covariate (independent variable). For the SCAS-P, our data indicated evidence for ASD impacting on all six factors on the SCAS-P; that is Physical Injury Fears, Obsessive Compulsive Disorder (OCD), Generalised Anxiety, Social Phobia, Panic/Agoraphobia and Separation Anxiety. Regression coefficients revealed differential item functioning in 16 of the 38 SCAS-P items. For some of these 16 items, ASD was associated with lower ratings (e.g. item 12 *'suddenly feeling unable to breathe when there is no reason for this'* had a rating of -0.231), whilst other items had a higher rating (e.g. item 7 *'afraid of being in crowded places'* with a rating of +0.513). This means that the relationship between the individual item scores and the individual factors (subscales) on the SCAS-P is different between groups of parents of children with ASD versus those without ASD. Therefore, similar to findings obtained by Toscano et al. (2017), results using the current data set indicate different measurement properties for the SCAS-P both at the subscale and item levels across the ASD and non-ASD groups. Interestingly, 7 of the 16 SCAS-P items that showed differential item functioning in the current data set were the same as the items identified as variant in the earlier study of measurement invariance of the SCAS-P (Toscano et al., 2017).

Similar results were obtained when MIMIC modelling was applied to the MABS. Data indicated evidence for ASD impacting on all five factors on the MABS; that is Separation Anxiety, Social Anxiety, Generalised Anxiety, Panic and Specific Phobia. At the item level, regression coefficients revealed differential item functioning in 7 of the 23 MABS items (Table 6). Similarly, ASD was associated with lower ratings for the same underlying level of anxiety for some items (e.g. a rating of -0.217 for item 46 *'My child told me that s/he suddenly felt his/her heart racing, felt*

*dizzy or wanted to be sick*'), but a higher rating for other items (e.g. a rating of +0.314 for item 10 *'My child took more care than other children to avoid getting hurt [e.g. refused to eat certain foods, used stairs instead of lift, crossed the road to avoid a dog]'*). These results are indicative of differential (variant) performance of the MABS when utilised with populations of young people with ASD compared to those without ASD.

## **Discussion**

The current study reported on the development and evaluation of a new parent measure, the Macquarie Anxiety Behavioural Scale (MABS), to assess anxiety in typically developing children and adolescents as well as children with ASD. Suggestions provided in past studies were taken into consideration during the development phase of the MABS. More specifically, we focused on item development that minimized the cognitive component as well as developed items that were geared towards more observable cognitive, behavioural and physiological symptoms of childhood anxiety. In doing so, we aimed to achieve a more accurate parental report of child anxiety by minimizing interpretation or assumptions of children's behaviour. A large sample of children and adolescents including children who were seeking help for anxiety, children with ASD (some of whom were also seeking help for anxiety), and children from the general community was utilised for the present study. Psychometric testing of the MABS revealed that of the five models tested by CFA, the five-factor solution with correlated errors provided the best fit for the data. The MABS is a measure that is disorder specific in line with anxiety disorders as per DSM-V (APA, 2013).

Replicating on findings from an earlier study by Toscano et al. (2017), the current study demonstrated that the factor structure of the SCAS-P across groups of children and adolescents with ASD (with and without anxiety) versus children without ASD, is not identical. Measurement

variance (non-equivalence) was found at both the subscale and item levels when using the SCAS-P with parents of children with ASD and those without ASD, indicating that different constructs are being measured and that parts of the SCAS-P function differently across the two groups. That is, given the same question to assess a child's level of anxiety for a given situation or stimulus and assuming the same base level of anxiety, parents in both groups would answer the same question differently. We can therefore confidently conclude that results from the SCAS-P cannot be interpreted in the same way in an ASD population compared to typically developing children with and without anxiety. On comparing results for the SCAS-P across both studies, differences are noted for MIMIC modelling using the two different samples. Findings from the present study revealed more variance (difference) for the SCAS-P compared to the earlier study. The different findings can be explained by the fact that different criteria for ASD diagnosis were set for the two studies; participants in the original study were allocated to the ASD group based on the ADIS-IV-C/P ASD screener, a structured clinical interview and parental report, whilst for the present study, ASD group allocation was based on parental report of a community acquired ASD diagnosis and ASRS T-Scores. An inconsistent approach to defining ASD across both studies and lack of validation of parental reported community based ASD diagnoses in the second study, most likely explains the variance obtained across the two studies.

A similar analytic process to that undertaken for the SCAS-P was conducted with the MABS. Measurement invariance of the MABS across an ASD and non-ASD group was tested to assess suitability of the MABS in the ASD population of children and youth. Assessment of measurement invariance of the newly developed MABS also indicated differential item functioning and variance at the subscale level when the measure was administered to parents of children with ASD versus children without ASD. Similar to the SCAS-P, trends of parental responding of anxiety

items on the MABS were different across the two groups of parents (ASD and non-ASD) assessed in our study. Lack of clarity around typical versus atypical anxiety as it presents in ASD as well as overlapping symptoms between anxiety and ASD in children and adolescents (Kerns et al.; 2014, 2016) most likely play a large role in explaining our findings. Despite very careful consideration of the literature in our attempts to design new items and amend existing items, the new measure did not result in items that were invariant across groups of typically developing children and children with ASD. The present findings highlight the need for ongoing research in understanding the phenomenology of anxiety in ASD, particularly to obtain clarity around differentiation between anxiety and ASD symptoms.

To further our understanding of how anxiety is conceptualised in ASD, closer examination of the seven items that showed differential item functioning on the MABS is warranted. MABS item 10 (*'My child took more care than other children to avoid getting hurt e.g. refused to eat certain foods, used stairs instead of lift, crossed the road to avoid a dog'*) includes 'food refusal' amongst a group of examples to address generalised worry. As picky or selective eating is commonly reported in children with ASD (Cermak, Curtin, & Bandini, 2010), this specific example may have led parents to focus more on ASD-related food selectivity as opposed to the anxiety element that the item intended to address. Items related to social anxiety, namely item 19 (*'My child avoided interacting with other children despite wanting to have friends e.g. avoided group work, team sports, parties, playdates, going to movies/hanging out with friends'*) and item 40 (*'My child talked about being embarrassed, laughed at or about others thinking s/he is stupid'*) may be tapping into ASD-related challenges associated with social communication, poor social skills and social confusion, more so than the fear of negative evaluation (Clark & Wells, 1995; Rapee & Heimberg, 1997) associated with these social situations that would be more synonymous with social anxiety as

it presents in children without ASD. Item 53 (*'My child became distressed by or avoided reading aloud, speaking or participating in class or during assembly'*), another item related to social anxiety may on the other hand be influenced by sensory sensitivities often experienced by individuals with ASD. As Kerns et al. (2016) noted, children with ASD often experience fears related to specific overwhelming sensory experiences such as crowds (as would be a crowded assembly environment). As such social anxiety related items that include elements of sensory experiences may not be a suitable in assessing 'traditional' anxiety that is separate to behaviour typically seen in ASD.

Other items that showed differential item functioning on the MABS included the panic-related item 23 (*'My child told me s/he does not want to participate in certain activities [e.g. sports, visiting new places] for fear of experiencing sudden and extreme symptoms e.g. heart racing, difficulty breathing, feeling faint'*) and item 46 (*'My child told me that s/he suddenly felt his/her heart racing, felt dizzy or wanted to be sick'*). These items may have been problematic for parents of children with ASD due to difficulties associated with children's limited awareness of internal body cues often reported by parents of children with ASD and clinicians who routinely work with this population. Finally, item 49 from the separation anxiety subscale (*'My child insisted on carrying or wearing a special item [e.g. bracelet, toy, blanket, book] when separating from a parent/caregiver'*) may also be related to a behaviour that is often observed or reported by parents in clinical settings where young children with ASD insist on carrying one or multiple preferred items. The function of this behavior may or may not be related to anxiety and as such, this particular item may not a very good item to assess anxiety in children with ASD.

The seven MABS items that showed differential item functioning and that are listed above, spanned across four of the five anxiety factors that constitute the MABS, namely generalized,

separation and social anxiety as well as panic disorder. Interestingly, no items from the specific phobia factor showed differential item functioning. One possible explanation is the fact that items within the specific phobia subscale of the MABS used very clear behavioural terms focusing on ‘refusal to engage’ in a said behaviour or situation and ‘avoidance’ of specific situations or stimuli. This is in contrast to other items that included terminology such as ‘my child told me that ....’ or ‘my child talked about ...’, which rely upon a child recalling, reporting or expressing anticipatory fear of an event or feared situation. Whilst both the SCAS-P and the MABS demonstrated measurement variance across all subscales when using the current dataset, this was not so at the item level. For the SCAS-P, results indicated that 22 of the 38 items indeed functioned similarly across the ASD and non-ASD groups. For the MABS, 16 of the 23 items also functioned similarly across the two groups. This indicates that for these particular items, the predicted parental trend of responding on the two anxiety assessment measures in question would be similar across both groups. These items can therefore be considered suitable items to assess anxiety in children and adolescents irrespective of presence or absence of ASD.

In summary, we developed a new parent measure to assess anxiety in children and adolescents including children with ASD. The new measure – the Macquarie Anxiety Behavioural Scale (MABS) produced a reasonable fit for the intended factor structure using data from this study. MIMIC results indicated that ASD impacted on the subscales and the items of the MABS. This is similar to the impact we found in the SCAS-P, that is, the impact of ASD (as defined by ASRS scores and community acquired diagnosis) on the MABS items seems to be as strong as its impact on the SCAS-P. We can therefore conclude that the presence of ASD may be altering the expression of some anxiety symptoms in children and youth. Children with ASD may differ in their anxiety symptom profile compared to their counterparts without ASD. Whether the observed anxious

behaviours represent a common underlying aetiology between anxiety disorders and ASD is yet to be determined. In the presence of anxiety, ASD type behaviours such as a rigid cognitive thinking style, stereotyped and repetitive behaviours as well as executive functioning difficulties such as difficulty shifting attention during daily activities, may be exacerbated, giving rise to a distinct type of anxiety that is different to the way anxiety typically presents in young people without ASD.

### **Limitations and Future Research**

Limitations in the present study include the lack of confirmation of parental reported community acquired diagnoses for the control and ASD groups. Another limitation is the fact that two of the assessment tools used to establish convergent and divergent validity for the MABS, namely the SCAS-P and the SMFQ-P, were not standardised for some of the age-brackets of the children included in our study (3-5 and 19 years). There were benefits that arose from utilising the same set of measures across all participants within our study.

The current study contributed towards a growing body of research on anxiety in ASD. Findings from our study provide information that can assist in understanding the structure of anxiety in ASD as well as the relationship between traditional anxiety and more ASD-related presentations of anxiety in children and youth. Items and subscales within the SCAS-P and the MABS as assessed in this study reveal important information about the expression of anxiety in ASD. We suggest that future research focus on further developing the MABS by replicating the present study and using an identical set of criteria for ASD and anxiety disorder diagnoses across all children involved in the study. Future parent assessment tools to assess anxiety in young people may wish to consider using items from the SCAS-P and the MABS that showed invariance across the ASD and non-ASD groups. It is expected that this process would yield an improved parent

measure of anxiety that will also be suitable for children and adolescents with ASD. Another option would be the development of an ‘ASD-testlet’ within a broader parent measure of anxiety that focuses on items developed specifically to address atypical anxious behavior (e.g. atypical fears) often observed in children with ASD. The sixteen MABS items that demonstrated measurement invariance across the ASD and non-ASD groups in the present study (that is, all MABS items excluding the ones listed in Table 6) could be considered for the ASD-testlet. Finally, future parent assessment measures may also wish to include a selective mutism subscale which, in the present study, was dropped from further analysis early on in the developmental phase of the MABS. Ongoing empirical investigation and improvement of currently used measures of anxiety will further refine the assessment process of anxiety and as a result lead to improved treatment and outcomes for children and adolescents with ASD.



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**Table 1.** *Demographic data and diagnoses*

Demographic		<i>N</i> = 734
Child gender	% Female	43.2
Child age (years)		<i>M</i> = 9.71 <i>SD</i> = 3.34
Parent age (years)		<i>M</i> = 40.06 <i>SD</i> = 6.70
Child Schooling		
% in Primary School		77.7
% in High School		19.9
% not in school		2.5
Ethnicity		
% Oceanic		71.8
% North-West European		17.1
% Southern and Eastern European		4.8
% North-African and Middle-Eastern		0.8
% South-East Asian		1.1
% North-East Asian		1.1
% Southern and Central Asian		1.2
% People of the Americas		1.0
% Sub-Saharan African		1.1
Family type	% Two-parent	79.2
Family home language	% Other than English	1.7
Parent relationship to child	% Biological parent	98.1
Diagnoses/Disabilities <sup>a</sup>		
% No Diagnosis		34.8
% Anxiety		38.6
% Depression		5.0
% Autistic Disorder		32.2
% Asperger's Syndrome		11.3
% PDD-NOS		3.4
% AD/HD		14.0
% ODD		4.8
% Conduct Disorder		0.1
% Intellectual Disability		4.4
% Other		9.9

*Note.* PDD-NOS = Pervasive Developmental Disorder - Not Otherwise Specified, AD/HD = Attention Deficit/Hyperactivity Disorder, ODD = Oppositional Defiant Disorder

*"Diagnoses/Disabilities for the Control and ASD samples were based on parental report. Anxiety Diagnoses for the Anxious sample were confirmed using the Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent versions (ADIS-IV-C/P; Silverman and Albano, 1996). Total % for Diagnoses/Disabilities ≠ 100% as parents in the Control and ASD samples were asked to select as many diagnoses/disabilities as applicable. 4 of the children within the anxious sample also met criteria for another neurodevelopmental disorder (2 ASD and 2 AD/HD).*

**Table 2. MABS Summary Table (Grouped by Anxiety Type)**

Item No.	Item Text	Anxiety Type (Factor)	ITC (Item Total Correlation) Cronbach's Alpha = 0.969)	Correlation with SCAS-P (r)	Correlation with ASRS (r)	Factor Loadings from Five correlated DSM factors Model (Estimate)
10	My child took more care than other children to avoid getting hurt (e.g. refused to eat certain foods, used stairs instead of lift, crossed the road to avoid a dog)	GAD	0.562	0.479	0.257	0.622
16	My child took more care than other children to avoid making mistakes or getting in trouble (e.g. checked or redid homework, left home early to get to school, made sure rules were followed)	GAD	0.454	0.417	0.042	0.512
35	My child asked many questions about new situations	GAD	0.637	0.535	0.38	0.680
36	My child talked about the worst thing that might happen in a situation	GAD	0.643	0.56	0.31	0.718
44	My child spent more time or effort than was needed preparing for activities (e.g. took extra pencils to an exam, studied constantly, practiced over and over, checked school bag was packed correctly)	GAD	0.506	0.425	0.22	0.552
18	My child told me s/he felt s/he was going crazy	PANIC	0.503	0.383	0.286	0.641
23	My child told me s/he does not want to participate in certain activities (e.g. sports, visiting new places) for fear of experiencing sudden and extreme symptoms e.g. heart racing, difficulty breathing, feeling faint	PANIC	0.630	0.534	0.335	0.675
41	My child suddenly started sweating and/or was unable to breathe even though there was no clear reason	PANIC	0.559	0.434	0.281	0.750
46	My child told me that s/he suddenly felt his/her heart racing, felt dizzy or wanted to be sick	PANIC	0.580	0.485	0.223	0.763
51	My child told me that s/he suddenly felt numbness or a tingling sensation	PANIC	0.488	0.391	0.269	0.687

6	My child was unable to sleep on his/her own	SAD	0.386	0.417	0.233	0.391
20	My child talked about something bad that might happen when we're not together	SAD	0.566	0.498	0.29	0.637
21	My child checked where I would be before separating or after (e.g. asked repetitive questions, called or texted)	SAD	0.624	0.496	0.313	0.681
49	My child insisted on carrying or wearing a special item (e.g. bracelet, toy, blanket, book) when separating from a parent/caregiver	SAD	0.555	0.434	0.423	0.594
13	My child either became distressed by or avoided performing (e.g. avoided sports, music, dance or drama performances, tests, exams)	SOC	0.688	0.565	0.373	0.789
19	My child avoided interacting with other children despite wanting to have friends (e.g. avoided group work, team sports, parties, playdates, going to movies/hanging out with friends)	SOC	0.682	0.523	0.42	0.733
38	My child avoided talking to other people despite talking easily at home (e.g. kept quiet, said very little)	SOC	0.605	0.459	0.377	0.628
40	My child talked about being embarrassed, laughed at or about others thinking s/he is stupid	SOC	0.567	0.485	0.272	0.583
53	My child became distressed by or avoided reading aloud, speaking or participating in class or during assembly	SOC	0.612	0.532	0.374	0.707
1	My child refused to travel in certain means of transport (e.g. train, bus, plane)	SPEC	0.504	0.393	0.359	0.573
14	My child refused to be around certain animals or insects (e.g. dogs, spiders)	SPEC	0.443	0.392	0.217	0.515
17	My child avoided one or more of the following situations – the dark, crowds, heights, storms or water	SPEC	0.584	0.557	0.341	0.658
25	My child refused one or more of the following - going to the doctor, going to the dentist, getting an injection	SPEC	0.513	0.442	0.431	0.626

*Note. GAD = Generalized anxiety; SAD = Separation anxiety; SOC = Social anxiety; SPEC = Specific Anxiety*

**Table 3.** Comparison of CFA Model fits for MABS using entire sample ( $N = 734$ )

Model	Description	$\chi^2$	$df$	RMSEA	90% CI	CFI	SRMR	Comparison	$\chi^2$ difference
1	One Factor	2020.04	230	0.103	0.099 0.107	0.738	0.073	-	-
2	Two factor Distress and Fear	1924.03	229	0.100	0.096 0.105	0.752	0.072	1 vs. 2	96.01 (df = 1) p = sig
3	Five correlated DSM factors	1132.12	220	0.075	0.071 0.079	0.867	0.061	2 vs. 3	791.91 (df = 9) p = sig
3a	Five correlated DSM Factors with correlated errors	668.65	210	0.055	0.050 0.059	0.933	0.047	3 vs. 3a	463.471 (df = 10) p = sig
4	Five hierarchical DSM factors	1181.11	225	0.076	0.072 0.080	0.860	0.062	4 vs. 3	48.99 (df = 5) p = sig

*Note.* RMSEA = root mean squared error of approximation; CFI = comparative fit index; SRMR = standardized root mean square residual. Recommended goodness of fit indices values demonstrating good model fit: RMSEA <0.06, CFI >0.95 and SRMR <0.08 (Brown 2015; Hu and Bentler 1999).

**Table 4.** *Summary of MIMIC models for SCAS-P (N = 587)*

Model	Description	$\chi^2$	df	RMSEA	90% CI	CFI	SRMR	Comparison	$\chi^2$ difference
1	Baseline No diagnosis group effect	3925.715	688	0.090	0.087 0.092	0.712	0.099	-	-
2	Diagnosis group effect on subscale	3782.258	682	0.088	0.085 0.091	0.724	0.085	1 vs. 2	143.46 (df = 6) p = sig
3	Diagnosis group effect on subscale and item	3328.529	662	0.083	0.080 0.086	0.763	0.074	2 vs. 3	453.73 (df = 20) p = sig

*Note.* RMSEA = root mean squared error of approximation; CFI = comparative fit index; SRMR = standardized root mean square residual. Recommended goodness of fit indices values demonstrating good model fit: RMSEA <0.06, CFI >0.95 and SRMR <0.08 (Brown 2015; Hu and Bentler 1999).

**Table 5.** *Summary of MIMIC models for MABS (N = 587)*

Model	Description	$\chi^2$	df	RMSEA	90% CI	CFI	SRMR	Comparison	$\chi^2$ difference
1	Baseline No diagnosis group effect	942.727	233	0.072	0.067 0.077	0.879	0.094	-	-
2	Diagnosis group effect on subscale	732.437	228	0.061	0.056 0.066	0.914	0.048	1 vs. 2	210.29 (df = 5) p = sig
3	Diagnosis group effect on item	585.943	216	0.054	0.049 0.059	0.937	0.041	2 vs. 3	146.49 (df = 12) p = sig

*Note.* RMSEA = root mean squared error of approximation; CFI = comparative fit index; SRMR = standardized root mean square residual. Recommended goodness of fit indices values demonstrating good model fit: RMSEA <0.06, CFI >0.95 and SRMR <0.08 (Brown 2015; Hu and Bentler 1999).

**Table 6.** *MABS items identified as variant across diagnostic (Anxiety and ASD) groups*

<b>MABS Item no.</b>	<b>Item Descriptor</b>	<b>Subscale</b>	<b>Estimate</b>	<b>Std. Err</b>	<b>z-value</b>	<b>P(&gt; z )</b>
<b>10</b>	My child took more care than other children to avoid getting hurt (e.g. refused to eat certain foods, used stairs instead of lift, crossed the road to avoid a dog)	GAD	0.314	0.091	3.462	0.001
<b>19</b>	My child avoided interacting with other children despite wanting to have friends (e.g. avoided group work, team sports, parties, playdates, going to movies/hanging out with friends)	SOC	0.467	0.093	5.007	0.000
<b>23</b>	My child told me s/he does not want to participate in certain activities (e.g. sports, visiting new places) for fear of experiencing sudden and extreme symptoms e.g. heart racing, difficulty breathing, feeling faint	PANIC	0.210	0.097	2.162	0.031
<b>40</b>	My child talked about being embarrassed, laughed at or about others thinking s/he is stupid	SOC	-0.455	0.116	-3.915	0.000
<b>46</b>	My child told me that s/he suddenly felt his/her heart racing, felt dizzy or wanted to be sick	PANIC	-0.217	0.076	-2.866	0.004
<b>49</b>	My child insisted on carrying or wearing a special item (e.g. bracelet, toy, blanket, book) when separating from a parent/caregiver	SAD	0.568	0.107	5.320	0.000
<b>53</b>	My child became distressed by or avoided reading aloud, speaking or participating in class or during assembly	SOC	-0.256	0.117	-2.186	0.029

*Note.* GAD = Generalized anxiety disorder; SAD = Separation anxiety; SOC = Social anxiety; SPEC = Specific phobia.

## **Chapter 4**

### **General Discussion**



## **General Discussion**

The studies presented in this thesis extend our knowledge on the presentation of anxiety in children and adolescents with Autism Spectrum Disorder (ASD) as well as provide an in-depth evaluation of current concerns related to the assessment of anxiety in young people with ASD. Results presented in the two studies indicate that the use of one particular assessment tool that is commonly used to assess anxiety in children with ASD – the Spence Children’s Anxiety Scale – Parent Form (SCAS-P) is limited in its use in the ASD population and caution should be exercised when interpreting assessment results. The development of a new parent measure – the Macquarie Anxiety Behavioural Scale (MABS) to assess anxiety in young people with and without ASD was also presented. Psychometric evaluation of the MABS indicated that further development is required before this measure can be considered suitable for assessment of anxiety in children and adolescents with ASD. Overall, results indicated that the SCAS-P and the MABS function differently across groups of children with and without ASD. The following general discussion provides a detailed account of the main findings from each study, followed by theoretical and clinical implications. The strengths and limitations of the studies are presented and directions for future research suggested.

## **Overview of Findings**

The first study, presented in Chapter 2 assessed the utility of a frequently used parent measure of anxiety - the Spence Children’s Anxiety Scale - Parent Form (SCAS-P; Spence, 1999) by assessing measurement invariance across a group of parents of children with anxiety and another group of parents of children with ASD (with and without anxiety). Archival data was utilised for this study. Multiple Indicator Multiple Cause (MIMIC) structural equation modelling (a confirmatory factor analytic approach) was utilized to analyse differences in the

factor structure of anxiety between both groups. As hypothesised, parts of the SCAS-P were found to be variant, that is, performed differently in the anxious and ASD populations indicating that psychometric properties of this measure cannot be generalised across both groups. MIMIC modelling showed that two of the six SCAS-P subscales (Physical Injury Fears and Obsessive Compulsive) and eleven of the individual SCAS-P items performed significantly differently across the two groups under investigation. Research findings indicated that the SCAS-P cannot be interpreted in the same way in an ASD population compared to neurotypical children with anxiety

The second study, presented in Chapter 3, focused on developing and evaluating a new parent report measure for anxiety in clinical and non-clinical populations of children and youth. The newly developed measure, the Macquarie Anxiety Behavioural Scale (MABS) focused on observable cognitive, behavioural and physiological symptoms of anxiety in children and adolescents. A second purpose of this study was to replicate findings of measurement variance for ASD in the SCAS-P (from Study 1), using a different (clinical and community) sample, to confirm whether results found in the first study still applied. Confirmatory factor analysis of the MABS showed that a five correlated DSM-factor model with correlated errors provided an optimal fit for the data. MIMIC modelling was used to assess the measurement invariance of the SCAS-P and the MABS to determine the performance of these two measures in an ASD population. As in the first study, evidence for measurement variance (difference) of the SCAS-P was found. Measurement variance was also found for the MABS, revealing different factor structures of anxiety between the ASD and non-ASD groups. MIMIC modelling showed that all six SCAS-P subscales and all five MABS subscales performed significantly different across the ASD and non-ASD groups that were investigated. Differential item functioning on a number of the SCAS-P and MABS items was also found, however 16 of the 23 MABS items showed

measurement invariance across the anxious and ASD groups indicating that these items function similarly across the ASD and non-ASD groups. The latter set of items can be considered suitable to assess anxiety in ASD.

## **Implications**

### **Theoretical implications**

Findings from the two studies presented in this thesis indicate that the factor structure of the SCAS-P is not identical across groups of children and adolescents with and without ASD (with and without anxiety). Results indicated that parental trend in responding to items on the SCAS-P is different between the anxious and ASD groups and also between the ASD and non-ASD (clinical and community) groups. Similarly, and despite careful consideration in item and scale development when developing the new parent measure of anxiety, the MABS, differential item functioning and measurement variance (difference) at the subscale level between parents of children with and without ASD was also found. These differences can be explained by differences in the underlying construct (anxiety) across children and adolescents with and without ASD or differences in the relations between latent constructs (anxiety) and scores for each measure in the two groups. That is, these differences can be explained by either measurement differences alone or measurement differences in addition to differences in the presentation of anxiety in groups of typically developing young people versus those with ASD.

A distinction between ‘traditional’ and ‘atypical’ anxiety in ASD has been suggested in the literature (Kerns, Kendall, Berry, Souders, Franklin, Schultz, & Herrington, 2014; Kerns, Renno, Kendall, Wood, & Storch, 2016) and the overlap versus co-occurrence or comorbidity of anxiety and ASD also discussed (Drabick & Kendall, 2010; Kerns et al., 2016). The present

thesis provides further evidence to confirm that an overlap or co-occurrence cannot be ignored in conceptualising and assessing anxiety in children and youth with ASD. Analysis of the subscales and individual items that demonstrated variance across both parent measures (the SCAS-P and the MABS) sheds some light on the overall co-existence of anxiety and ASD symptoms in children and youth. Distress related to sensory sensitivities typical of an ASD presentation such as food sensitivities, challenges coping with loud noises and difficulty tolerating crowds may give rise or exacerbate anxiety symptoms related to specific phobias and social anxiety. Poor social skills and lack of confidence in manoeuvring social environments also gives rise to anxiety about social situations. A need for sameness and predictability and conversely challenges around tolerating changes in schedules or routines may trigger generalised worries and separation fears often seen in children with generalised anxiety disorder and separation anxiety respectively. This in turn leads to similar behavioural patterns such as repetitive questioning, a need for reassurance and avoidance, typically seen in children with anxiety (without ASD). Difficulty managing emotions and a more rigid cognitive style often found in individuals with ASD results in greater difficulty coping with anxiety and worry leading to unexpected physical symptoms of anxiety often seen in panic attacks such as ‘heart racing’, ‘difficulty breathing’ or ‘feeling faint’.

Overall, it is difficult to clearly differentiate between ‘traditional’ anxiety and ASD-related behaviours that may present very similar to anxiety symptoms. However, a number of possible conclusions can be drawn. Anxiety in ASD may have unique characteristics such as cognitive rigidity, social confusion, limited emotional insight as well as shared elements with more ‘traditional’ anxiety such as negative thinking, an anxious cognitive style, physiological arousal and hypersensitivity (Kerns et al., 2014; Ollendick and White, 2013). Challenges associated with ASD, predispose children and youth with ASD to both traditional and atypical

expressions of anxiety. ASD characteristics may contribute to a child's distress beyond what could be explained by symptoms of an anxiety disorder alone. Upon experiencing anxiety, a child with ASD who will typically also have difficulty recognising internal states and communicating distress, may be less likely to utilise emotion management tools to cope with the anxiety. This in turn reinforces unhelpful thoughts about an inability to manage anxiety which results in maintenance of anxiety in the longer term.

### **Clinical implications**

Measurement variance found in both the SCAS-P and the MABS across the two studies presented in this thesis indicates that the factor structure of both measures is not identical across groups of children with and without ASD and that the parental trend of responding to items on both measures is therefore different. As such, parts of these assessment measures cannot be interpreted in the same way in an ASD population compared to typically developing children with and without anxiety. As Glod et al. (2017) suggested, and given the findings from the two studies reported in this thesis, researchers and clinicians should not rely solely on SCAS-P scores when assessing anxiety symptoms in individuals with ASD.

The validity of current measures to assess anxiety in children and adolescents have only very recently started to be assessed in the ASD population (e.g. Jitlina et al., 2017; Magiati et al., 2017, Glod et al., 2017). New measures are also being developed; for example, the Anxiety Scale for Children - ASD, Parent and Child versions (ASC-ASD; Rodgers, Wigham, McConachie, Freeston, Honey, & Parr, 2016). The present thesis extends on progress to date by providing information about the validity of the SCAS-P in children and youth with ASD. Knowledge of which SCAS-P subscales and individual items function differently across children with and without ASD is useful as in clinical practice; responses on this particular

measure can be discussed with the parents or caregivers to allow for further elaboration of observations of the children's behaviour which further informs clinical formulations of a child's presenting problems. As a result, treatment plans can be better tailored to the child's and family's needs allowing for more effective treatment overall. This is important in any clinical setting; however, it is especially so when working with children and adolescents with ASD who present with a rigid cognitive style and executive functioning difficulties making the learning of new skills, implementation of skills learned and generalisability of such skills across settings difficult due to challenges that are inherent to ASD.

The newly developed MABS provides a set of invariant items that can be put forward for further development of an assessment measure for anxiety in young people with and without ASD. Items that demonstrated invariance (performed similarly) across a group of children with ASD and another without ASD, that is items that were not impacted by ASD symptomatology, are promising items in the development of a robust scale for the assessment of childhood anxiety. In view of ASD-related challenges with communication, limited insight into internal states such as anxiety and parental difficulties interpreting children's anxious behaviour, the MABS provides items that are more focused on observable cognitive, behavioural and physiological symptoms of anxiety in children and adolescents. As shown in the second study on the development of the MABS, items that were worded in very clear behavioural terms such as the MABS items that focused on 'refusal to engage' in a said behaviour or situation and 'avoidance' of specific situations or stimuli function equally across the ASD and non-ASD groups. It is therefore expected that these items are well suited to assess anxiety in children and adolescents irrespective of the presence or absence of an ASD diagnosis.

### **Strengths of the present research**

The studies presented in this thesis contribute to (i) further psychometric evaluation of the SCAS-P in young people with ASD, and (ii) the development of a new parent measure for anxiety that addressed limitations reported in previous studies. One of the strengths in the studies presented is the sample size; a reasonable sample was utilised for the first study ( $N=426$ ) and a large sample was used for the second study ( $N=734$ ). A wide age range (3-19 years) for the children of participants (parents) in the studies presented is also considered a strength; the broader range allowed us to capture anxiety as it presents across a number of developmental stages during the childhood to adolescence.

To our knowledge, the two studies presented here are the first to use Multiple Indicator Multiple Cause (MIMIC) modelling to assess measurement invariance across an anxious and ASD group of young people in the first study, and across an ASD and non-ASD (clinical and community) group of young people in the second study. In doing so, it was possible to determine whether the measures being investigated assess anxiety (as a latent construct) similarly and therefore perform similarly across groups of children with and without ASD. As measurement invariance analysis indicates whether an instrument measures a construct in the same way across different populations or groups (Millsap and Kwok, 2004), it was possible to draw meaningful comparisons between the two groups assessed.

Assessment tools utilised in both studies presented in this thesis, including tools that were used to assess for convergent and divergent validity of the MABS, were all reliable tools that are well-validated in typically developing samples and frequently utilised in research and clinical practice; namely the Spence Children's Anxiety Scale – Parent Report (SCAS-P; Spence, 1999), the Strengths and Difficulties Questionnaire – Parent Report (SDQ-P; Goodman,

1997), the Short Mood and Feelings Questionnaire – Parent Report (SMFQ-P; Angold, Costello, Messer, Pickles, Winder, & Silver, 1995) and the Autism Spectrum Rating Scales (ASRS; Goldstein & Naglieri, 2010). Use of such measures allowed for meaningful conclusions to be drawn and a solid platform for future studies to build upon. Finally, the fact that findings from the first study were replicated in the second study using a different sample, provides stronger evidence for reliability of conclusions presented throughout this thesis in relation to measurement invariance of the SCAS-P.

### **Limitations of the present research**

The present thesis is not free from limitations. First, acquisition of ASD diagnoses for the children in the two studies was varied. Diagnoses were based on one or a combination of the following: an ASD screening tool, clinical interview, parent report of community acquired diagnosis or meeting cut-offs on the Autism Spectrum Rating Scale (ASRS; Goldstein & Naglieri, 2010). Previously acquired diagnoses were assumed to be accurate and therefore not re-assessed using a more consistent diagnostic approach across all participants. A lack of consistency in the assessment process poses a limitation in our findings. Furthermore, information regarding cognitive ability of the children and adolescents in our sample was not available, making it difficult to draw conclusions around whether our findings hold for young people with ASD across different levels of functioning.

In the first study, a moderate sample size was used which allowed for enough power for MIMIC analysis. Had a larger sample been available, a Multi-Group Confirmatory Factor Analytic (MGCFA) approach to assess the factor structure of the SCAS-P across the ASD and non-ASD groups could have been used which may in turn, have yielded more accurate results. In the second study, two of the assessment tools used to establish convergent and divergent



validity for the MABS, namely the SCAS-P and the SMFQ-P, were not standardised for some of the age-brackets of the children included in our study (3-5 and 19 years). As such, findings from the second study as they apply to children aged 3-5 and 19 years should be interpreted with caution.

Another limitation is related to the assessment of the SCAS-P across both studies. Analysis was conducted by assuming that the original six correlated-factor structure provided a good fit of the data (Spence, 1997). Confirmatory factor analyses of the SCAS-P conducted recently by Glod et al, (2017) and Jitlina et al., (2017) did not support this factor structure; in fact, a six-factor model for the ASD sample, and a seven-factor model for the anxious sample was proposed by Glod et al. (2017) whilst a four-subscale structure was proposed by Jitlina et al. (2017). In view of disagreements found in the literature on the best factor-structure of the SCAS-P in children and youth with ASD, assuming that the original six correlated factor structure is a good fit for the data in the studies presented in this thesis poses a limitation to the findings. Finally, the use of secondary and archival data in the first study, poses another limitation as it is difficult to determine whether differences obtained across the anxious and ASD groups were due to pre-existing differences between the two groups or due to real differences in the latent construct.

### **Directions for future research**

It is encouraging to see that over the past decade, efforts have been made to improve our understanding of the underlying mechanisms of anxiety in ASD. Research in this area is still in its very early stages and more empirical research is required to disentangle symptoms of anxiety and ASD which can often present very similarly in children and adolescents. Efforts to assess suitability of currently used measures of anxiety in young people with ASD should also continue

to allow for a valid and reliable set of assessment measures to be selected as appropriate for use in children with ASD.

To obtain a better understanding of the experience of anxiety in children with ASD, we need better tools to assess anxiety in the first place. However, development of assessment tools is also informed by theoretical aspects of anxiety and ASD. As anxiety measures already exist and new ones are being developed for ASD samples, future research could continue on the path of improving assessment tools to further inform the comprehensive and multidimensional expression of typical and atypical anxiety as it presents in ASD. As shown in the studies presented in this thesis, measurement invariance methodology can be utilised to assess suitability of existing measures of anxiety in the ASD population. Additionally, further development of the MABS is strongly encouraged as it is believed that the MABS items provide a solid start to the development of an anxiety measure that will be suitable for the assessment of anxiety in children with and without ASD.

Any future attempts at improving or developing new measures to assess anxiety in children with ASD should take into consideration intrinsic ASD characteristics such as limited emotional insight and communication challenges. Abstract concepts and a heavy cognitive component should also be avoided as these elements pose significant challenges in the ability of young people with ASD to identify and express their anxiety as well as their care-givers' ability to interpret their children's anxiety. Findings presented throughout this thesis can be utilised to develop an improved measure of anxiety for children and adolescents. More specifically the items that demonstrated invariance across the SCAS-P and the MABS, that is, the items that were not impacted by ASD and performed similarly across groups of children with and without ASD, could be grouped together to form a revised and combined version of the best parts of the

SCAS-P and the MABS for the young ASD population. Alternatively, an ‘ASD-testlet’ that could draw from the invariant items mentioned above, within broader parent measures of anxiety may be found suitable for the assessment of anxiety in children and youth with ASD.

Finally, the assessment of anxiety in non-verbal populations of children and adolescents with ASD and children who are more severely impacted by their ASD is an area of research that is strongly encouraged. It is expected that as more clarity is obtained on the expression and presentation of anxiety in children and youth with ASD and better tools are developed to assess anxiety, research efforts can then turn to the young people who are significantly impacted by ASD and anxiety and who may not have the necessary skills to communicate verbally about their experiences.

### **Summary and conclusions**

The present thesis comprised two studies focusing on the assessment of the utility of the SCAS-P in a sample of children and adolescents with ASD as well as the development of the MABS, a new parent measure of anxiety for use in children with and without ASD. Research findings indicate that the factor structure of SCAS-P in an ASD versus non-ASD group is not identical and as such, parts of the SCAS-P in children and adolescents with ASD cannot be interpreted in the same way as they would be in typically developing children. Results obtained on the SCAS-P when used with children and youth with ASD should therefore be interpreted with caution. The newly developed measure, the MABS, demonstrated a reasonable fit for the data in the study. Similar to the SCAS-P, parts of the MABS also showed measurement variance indicating that some subscales and items cannot be interpreted in the same way across populations of children with and without ASD. Overall, ASD impacted on both anxiety measures evaluated in this thesis, providing further evidence that whilst some overlap exists

between anxiety and ASD in young people, anxiety and ASD symptoms also co-occur and present as separate factors in ASD. Theoretical and clinical implications highlight the fact that further research on the presentation and assessment of anxiety in ASD is warranted. The studies in this thesis provide a stepping stone in the right direction for future development of suitable assessment measures for anxiety in children and adolescents with ASD.

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