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Mozolic-Staunton, Beth; Barbaro, Josephine; Donnelly, Michelle; Yoxall, Jacqui

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Interrater reliability of early childhood education professionals involved in developmental surveillance for autism spectrum disorder and related conditions

Beth Mozolic-Staunton

Southern Cross University

Michelle Donelly

Southern Cross University

Josephine Barbaro

La Trobe University

Jacqui Yoxall

Southern Cross University

Abstract

Valid and reliable tools have recently been developed to accurately detect early signs of Autism Spectrum Disorder (ASD) and other developmental challenges in children as young as 12 months of age. Translation of research findings to practice and policy through routine implementation of evidenced-based tools in the community, particularly early childhood education and childcare settings is limited. This study establishes that the interrater reliability (IRR) of early childhood educators in administering the Social Attention and Communication Surveillance System (SACS-R) is very high ($k = 0.909$). This paper reports the results of the first step in the Right Kids, Right Time, Right Services project—a prospective cohort study that aims to implement and evaluate routine developmental surveillance for early signs of social and communication challenges in young children in childcare settings.

Introduction

Children who are at risk for Autism Spectrum Disorder (ASD) and other developmental challenges would benefit from early identification and access to early intervention, as this takes advantage of a child's early brain plasticity (Dawson, 2008; Webb, Jones, Kelly & Dawson, 2014). Identification of developmental challenges enabling access to early intervention is a two-step process that has been found to be fraught with challenges, resulting in up to 22 per cent of vulnerable children being undetected before primary school (DET, 2016). Without consistent implementation of effective early detection methods, many young

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children miss out entirely on crucial early intervention supports. To enable access to early intervention, developmental surveillance using reliable and valid methods must be completed first by qualified professionals in the community. Typically, general practitioners or maternal child health nurses are responsible for conducting developmental screening during health visits. Clear guidelines for developmental surveillance using evidenced-based methods for community professionals do not exist. If concerns about development are present upon screening, a referral for comprehensive diagnostic evaluation is made to a multidisciplinary team of specialists, which are in limited supply in many Australian communities. Research to determine the most effective methods of surveillance to detect which young children in the general population would most benefit from comprehensive developmental assessment and early intervention is essential to enabling timely access for developmentally vulnerable young children. Childcare settings present an ideal opportunity for ongoing developmental surveillance and appropriate, timely referral of young children to comprehensive assessment and early intervention supports.

ASD is a neurodevelopmental disorder characterised by persistent deficits in social communication and restrictive interests, repetitive behaviours or sensory sensitivities in early childhood (American Psychiatric Association, 2013). Along with an increase in the knowledge of the signs of autism, the number of children being diagnosed with ASD has risen sharply over the past decade and prevalence is now estimated at one in 100 births (Pinborough-Zimmerman et al., 2011), to one in 68 births worldwide (Centers for Disease Control and Prevention, 2014). This condition affects individuals, families and communities around the world and is found across all socioeconomic and ethnic groups (Baio, 2012).

ASD is diagnosed on behavioural criteria that consider social communication and behavioural deficits that emerge in early childhood and can persist throughout life (American Psychiatric Association, 1994, 2013). Many children who are at risk for ASD are not identified until late childhood, although a diagnosis of ASD can reliably be made when a child is 18–24 months old (Barbaro & Dissanayake, 2009; Lord et al., 2006; Webb & Jones, 2009). In fact, recent research suggests that ASD can be detected as young as 12 months of age; however, children are typically not diagnosed until after three years of age (Chakrabarti & Fombonne, 2005; Veness et al., 2012), with the average age of diagnosis of ASD in Australia being 4.1 years (Bent, Dissanayake & Barbaro, 2015). There are definite weaknesses in the current system of community screening and developmental surveillance for ASD (Zwaigenbaum et al., 2015), and a clear need for further research and innovation to improve practice across a wide variety of clinical and community settings.

Timely early intervention can be especially effective for ASD if quality care is provided consistently (Dawson et al., 2010; Howlin, Magiati & Charman, 2009; Rogers & Vismara, 2008). Potential benefits of early intervention for children with ASD include maximising their

potential development and preventing secondary symptoms of the disorder such as aggression, restricted routines and rituals, and severe social and communication difficulties (Barbaro & Dissanayake, 2009; Dawson, 2008; Webb et al., 2014). Children who receive intensive, early intervention are more likely to communicate verbally and receive more inclusive educational placements (Charman & Baron-Cohen, 2006). Early identification may also enable parents to be better informed about genetic risks to younger siblings (Zwaigenbaum et al., 2009). Early identification also provides opportunities for parents to access specific ideas for intervention and information about access to supports (Charman, 2003).

In their updated report for the Australian Government, Prior, Roberts, Rodger and Williams (2011) provided a review of evidence on effective early intervention practices for children with ASD and recommended that children with ASD access intervention in their natural environment that is individualised to their strengths and needs and developed and delivered by a collaborative, interdisciplinary team (2011). This study provides insight into the current implications of identifying and supporting children in their natural environment, specifically early childhood education and care centres.

In Australia and internationally, there have been several significant advances in recognising the value of early intervention for young children with ASD through government policy. The 'Helping Children With Autism' package launched by the Australian Government in 2006 and expanded to include other disabilities under the name of 'Better Start' in 2013 is currently being subsumed by the National Disability Insurance Scheme (NDIS) in a staged approach across Australia. The Australian Cooperative Research Centre, 'Living with ASD' lists *improving practice in early detection* as one of five priorities of the research program (Autism CRC, 2014). In North America, 'Healthy People 2020' identifies early screening and reduction of age of ASD diagnosis as key strategies for improving health outcomes for children and families (United States Department of Health and Human Services, 2014) while the American Academy of Pediatrics recommends an ASD specific surveillance process to be implemented by physicians at 18 and 24 month 'well child' visits (Johnson & Myers, 2007). Despite these national and international policy recommendations for routine developmental surveillance in early childhood, screening and surveillance for autism is not routinely available in early childhood (Mandell, Ittenbach, Levy & Pinto-Martin, 2007; Pinto-Martin, Dunkle, Earls, Fliedner & Landes, 2005). A 2013 review of early identification of ASD across a range of methodologies concluded that further research on the effective application of early identification strategies and building capacity across health systems to ensure timely access to specialised diagnostic assessment and evidence-based intervention is needed to improve outcomes for the many children and families affected by ASD (Zwaigenbaum, Bryson & Garon, 2013).

There is a lack of a systematic process for the early detection and follow-up of children with ASD in Australia (Garg, Lillystone, Dossetor, Kefford & Chong, 2014). Inconsistencies exist among primary care providers within and between states regarding knowledge of the early signs of ASD, screening and diagnostics and options for early intervention (Oosterling et al., 2010). In an effort to identify issues related to developmental challenges facing Australian children, the Australian Early Development Census (AEDC) is being implemented every three years across the country to measure children's development as they enter school (DET, 2016). The AEDC has identified that approximately 22 per cent of Australian children are developmentally vulnerable in one or more key domains of physical health, social competence, emotional maturity, language and cognitive skills, communication and general knowledge (DET, 2016). This is well above the reported 15 per cent prevalence level for developmental delays among children worldwide (Yeargin-Allsopp & Boyle, 2002). The identification of developmental delay during early childhood can be challenging, as the ages at which milestones are achieved are variable (Limbos & Joyce, 2011). There are ongoing efforts to effectively identify and support children with developmental challenges in the health and education systems. Gaps exist in current identification and support arrangements and many children are not able to access early intervention services (Gold Coast Medicare Local, 2012).

An integrated system across medical and community settings that incorporates multiple methods of early detection in combination with effective and timely interventions would ideally promote improved developmental outcomes for children (Council on Children with Disabilities et al., 2006). Studying the translation of effective developmental surveillance processes and tools into new community contexts to facilitate improved accuracy in early detection of developmental challenges is warranted. Children who potentially have ASD need referral to professionals with specialist training in diagnosis and intervention for ASD. These clinicians are often in short supply and long wait lists are common. Resource implications associated with potential over-referral (false positive results of screening) are also problematic (ABS, 2012). It is therefore important that all early childhood professionals working in a range of settings—primary care, child care, schools—accurately determine which children need comprehensive confirmatory evaluations and which do not.

Developmental surveillance of ASD in young children: Social Attention and Communication Surveillance-Revised (SACS-R)

Recent developments in the prospective identification of ASD in young children have emerged as a result of a large scale community-based prospective study of a developmental surveillance instrument for ASD developed through the Social Attention and Communication Study (SACS) (Barbaro & Dissanayake, 2010). This tool has been recently revised, now known as Social Attention and Communication Surveillance-Revised (SACS-R). Researchers at the Olga Tennison Autism Research Centre, Melbourne, implemented a developmental

surveillance program with 22 168 children. Maternal and child health nurses from 184 health centres in 17 local government areas in metropolitan Melbourne were trained to monitor children's development using skilled observations during their routine 'well child' checks at eight, 12, 18 and 24 months. The training emphasised typical and atypical social communication and the specific developmental markers of ASD. Children who showed a pattern of failure on key items were referred for a comprehensive developmental and diagnostic assessment by the research team. Developmental surveillance for ASD using the SACS-R is currently being trialled in health settings in Australia (Victoria, New South Wales [NSW], Tasmania) and internationally in China, Poland, South Korea, Japan and Bangladesh (Olga Tennison Autism Research Centre, 2014). Reliability of nurses' monitoring of early behavioural signs of ASD using the SACS-R during routine check-ups was determined as >0.90 for all items and >0.83 for each individual key item (Barbaro & Dissanayake, 2010).

When implemented by maternal child health nurses, the SACS-R was found to have an overall positive predictive value (PPV) of 90 per cent at 12 months, 79 per cent at 18 months and 81 per cent at 24 months. The estimated sensitivity of the SACS is 83 per cent and specificity is 99.8 per cent. The SACS did not have a large number of false positives, with no typically developing children being identified as 'at risk'. Positive predictive value was high, which contrasts with the widely used 'point-in-time' screening tool—the Modified Checklist for Autism in Toddlers (M-CHAT) (Barbaro & Dissanayake, 2010). The training of nurses on the early signs of ASD was found to have contributed to their ability to accurately identify children at risk of ASD in the general population from as early as 12 to 18 months for some children. The repeated monitoring of children across ages, rather than administration of a single screening instrument at a given age, was found to improve the efficaciousness of the early identification of ASD (Barbaro & Dissanayake, 2010). SACS-R has been found to be the most reliable developmental surveillance tool available in the primary health setting and translation of this tool across early childhood education and care (ECEC) settings has the potential to reduce the two-two-and-a-half- year delay in detecting developmental challenges in young children.

As a first step in implementing and evaluating a process of monitoring the development of all young children in ECECs, this study seeks to establish the reliability of early childhood educators in identifying early signs of ASD in young children in their care. Establishing the IRR between early childhood educators and an expert clinician in identifying young children with early signs of developmental challenges using the SACS-R will support the generalisation of previous findings that maternal-child health nurses have high IRR using SACS-R (Barbaro & Dissanayake, 2010) to the ECEC sector.

The case for implementation of developmental surveillance for ASD by early childhood educators

ECEC reform has been a key issue for national and state governments in recent years. Outcomes of government initiatives including the *Early Years Learning Framework*, early childhood workforce reforms and the *National Quality Standard* for child care and preschool have significantly increased access and improved the quality of early childhood education (DEEWR, 2009; COAG, 2009). Increasing numbers of infants and toddlers attend community child care in Australia, and all children now have access to a preschool program that is delivered in the year before schooling by a four-year university qualified early childhood teacher for a minimum of 15 hours per week at a reasonable cost (COAG, 2009).

Assessment and monitoring of children's wellbeing and development throughout early childhood is an important responsibility of early childhood services (Moore & Grove, 2008; NAEYC, 2009). However, there is evidence that the current system of health services screening and surveillance is failing to detect all the children who need additional help (Glascoe, 2005; Moore & Grove, 2008; Sayal, 2006). It has been suggested that some of the reasons why children and families in need of help are not identified in a timely manner is that health care providers may use inappropriate screening tools or techniques, rely too heavily on unstructured clinical observation or informal checklists, or use screening tests that have been found to be overly sensitive or not specific enough for use in the general population (Branson, Vigil & Bingham, 2008). Children from disadvantaged or geographically mobile families may also not have ongoing contact with a primary physician and sporadic contact with health services. When children are identified, they are frequently not referred to appropriate early intervention services or child development programs (Glascoe, 2000; King & Glascoe, 2003). Despite recommendations that physicians monitor and screen child development, evidence suggests that the majority of children with developmental delays are still not being identified before they reach school age. The incidence of developmental disabilities for children from is estimated at 15 per cent (Boyle et al., 2011)(American Academy of Pediatrics, 2001), while the rates of children actually receiving early intervention or early childhood special education services are significantly lower (1.8 per cent for children under two years and 5 per cent for children three–five years) (Bailey, Hebbeler, Scarborough, Spiker & Mallik, 2004). Branson et al. (2008) argue that general practitioners are unable to adequately implement developmental surveillance because of time limitations, and that research and resources should be focused on the development of community-based screening programs that include early childhood education and care professionals as partners in the identification and referral of children at risk for ASD.

Within the Australian health care system, few states have well-established services for supporting young children and families through maternal and child health nursing services and limited access to regularly scheduled visits over the child's first 42 months of life. While

the take-up of this service is strong in some communities (over 90 per cent) for newborns, attendance significantly drops off with only 58 per cent of children participating in the final visit at three-and-a-half years (Moore & Grove, 2008). The ability of nurses to effectively identify emerging health issues and support parents with developmental and behavioural concerns for toddler and preschool age children is decreased by sporadic visits in the older age groups and inconsistencies across states and regions.

While childcare settings appear to present an ideal opportunity for ongoing developmental surveillance, there have been no studies investigating the effectiveness of prospective identification of young children by ECEPs. In the current literature review, only two groups of researchers have been found to have studied the contribution of early childhood educators to the process of early detection of ASD. A comparison of an ASD specific screening tool completed by childcare professionals with frequently used parent questionnaires in a high-risk sample found that childcare professionals were effective in the early detection of ASD (Dereu et al., 2010).

Early childcare providers are often engaged with a child across a variety of situations and times for many hours per week over several months or years. They observe and support children's interactions with similarly aged peers in many different types of play, self-care and communication activities. The first-hand observations of primary caregivers in the assessment of a child in their natural environment improves reliability of results and are more likely to accurately reflect the child's true developmental status (McLean & Crais, 2004). Early childhood education providers are supported by state and national initiatives to enhance their professional skills in understanding and supporting children's development and may be able to connect families with community support resources and early intervention services.

Training early childhood educators in the use of a sensitive and specific developmental surveillance tool, designed to assess key developmental behaviours across time, such as the SACS-R, is likely to increase the chances of accurately detecting ASD in young children. The current study set out to provide training to early childhood educators in the use of the SACS-R and then to investigate the IRR of early childhood educators administering this surveillance tool.

Method

Participants

A representative sample of educators ($n = 45$) from 17 different ECEC centres (long day care) across the Northern Rivers, NSW, and Gold Coast, Queensland (Qld) regions of Australia with a diverse range of professional experience and qualifications and a clinician with extensive training and experience in assessment and intervention for young children with

developmental challenges, including ASD participated. The study was limited to long day care centres to ensure an appropriate sample size for statistical analysis.

Educators from each centre who regularly provide care for children aged from 12 months to three-and-a-half years received training to administer the SACS-R. The participating educators' level of experience ranged from one–10+ years with qualifications in early childhood education including certificate to bachelor degree level. Ethical approval was obtained from Southern Cross University Human Research Ethics Committee (Approval # ECN-14-238) and all ECEC centres in the region were invited to participate. Informed consent to participate was obtained from each educator as well as the children and parents enrolled in the ECEC centres.

Instrument

The SACS-R is a series of checklists designed to monitor key behavioural markers for social and communication challenges at 12, 18, 24 months and three–five years. Key social and communicative behaviours assessed by SACS-R include the quality of a child's eye contact, pointing, response to their name, social smiling, imitation, use and understanding of language, joint attention, social gestures, social communication, pretend play and parallel play. Additionally, the presence of abnormal behaviours that are frequently associated with developmental conditions can be identified using SACS-R including repetitive, stereotyped or ritualising behaviours, echolalia and any loss of skills. Children who are considered to be 'at risk' for ASD demonstrate a pattern of 'atypical' behaviour on at least three 'key' items.

Procedure

Training of ECEPs consisted of either attendance at a three-hour workshop on the early signs of ASD with a focus on examples of typical and atypical presentation for key behavioural markers, presented by Dr Josephine Barbaro—author of the SACS-R in February 2015—or an individual coaching session, conducted in the early childhood education classroom by the primary researcher, who is an experienced paediatric therapist with 10+ years of experience in assessment and intervention for children with ASD.

To ensure that children were happy and willing to participate in the research, ethical practice guidelines (Kellett, 2011) for engaging with very young children were implemented in all aspects of the study. Both the researcher and participating early childhood educators worked collaboratively with the children and their families to ensure that age appropriate consent was obtained and the children's environment and interactions were safe, secure, playful and positive at all times. It should also be noted that children were observed during their regular early childhood routine and that no interruption to their typical routine was required.

To determine reliability of the educators in administering the SACS-R, each item corresponding to the child's age was independently and simultaneously co-rated by the researcher and an early childhood educator with one–two children in their care. The researcher had not previously met the children and was blind to any clinical or educational information. Data was gathered within the typical play-based routine of the classroom, consistent with the protocol for administration of SACS-R.

Results

To explore the IRR of the measure in a group of ECEPs, the SACS-R checklist corresponding to the child's age was completed across a sample of children at each of the four SACS-R age groups ($n = 9$ at 12 months; $n = 7$ at 18 months; $n = 19$ at 24 months; and $n = 10$ at three-and-a-half years). Interrater reliability was calculated using Kappa statistics to measure the observed level of agreement between coders for nominal ratings of Typical versus Atypical and account for the proportion of agreement that would be expected by chance (Portney & Watkins, 2009). Statistical Package for the Social Sciences (SPSS) Statistics 22 was used to calculate Kappa statistics.

Results were analysed and reported according to Guidelines for Report Reliability and Agreement Studies (Kottner et al., 2011). Interrater reliability was defined by agreement between the SACS-R scores of the expert clinician and the SACS-R scores of the ECEPs. An IRR analysis was performed to assess the degree that the clinician and ECEP were consistent in assigning categorical ratings of 'Typical versus Atypical' performance on key items on SACS-R. The incidence of 'Atypical' ratings did not indicate prevalence or bias problems, thus Cohen's (1960) kappa was chosen as an appropriate index of IRR. Reliability on results of SACS-R when administered by ECEPs was statistically significant ($p < 0.001$) and very high ($k = 0.909$), with agreement in 43 out of 45 cases.

Discussion

The aim of the current study was to determine the IRR of early childhood educators in comparison with an expert clinician in identifying young children with early signs of developmental challenges using the SACS-R. The overall reliability of early childhood educators in identifying the specific children in their care who would benefit from specialised assessment for ASD using SACS-R was very high ($k = 0.909$), with 43 out of 45 educators agreeing with the clinician on typical versus atypical performance ratings in relation to key behavioural indicators. While more variability was evident for 24 months on individual items,

the proportion of agreement was well above the accepted standard (80 per cent) for screening tools (Kraemer, 1992).

This study demonstrates that the reliability of ECEPs in identifying young children in their care who would benefit from specialised assessment for ASD is consistent with that of maternal child health nurses (0.90) as reported by Barbaro and colleagues (2010). These results provide support for the key role early childhood educators can play in identifying and supporting young children with ASD and other developmental challenges. With training (either workshop or coaching format) early childhood educators with a range of levels of experience and tertiary education can reliably administer the SACS-R with children in their care. The addition of clear evidence of IRR, combined with the central, trusted caregiving role ECEPs have in the lives of many young children and families and their knowledge and experience in child development, paves the way for ECEPs—working in collaboration with health providers—to conduct routine monitoring for ASD in young children and to develop referral pathways for further specialised assessment without the risk of over referral. This in turn would support and enhance the role of childhood educators in promoting crucial and timely access to early intervention and supports for young children with developmental challenges and their families.

The sampling of participants included in this study was limited to those working in ECEC centres that previously consented to participate in a large prospective developmental surveillance study and therefore participants are likely to have the potential for bias toward a proactive stance on early identification and inclusive education practices. Due to practical limitations, only ECEC centres in the geographical location of regional and suburban communities in Northern NSW and Southeast Qld were included and results should be generalised with caution.

While the benefits of early identification are clear, caution must be applied in the communication and delivery of potentially sensitive information regarding a child's development (Branson et al., 2008). There are valid concerns about the risks of labelling a child incorrectly which may result in lowered expectations and stigmatisation (Trivette, Dunst & Hamby, 2004). One significant challenge can be initiating discussion with a parent regarding concerns about their child's development in a sensitive and supportive manner. It is also important to note that no definitive identification or concerns can be raised without comprehensive developmental assessment. Rather than educators specifically raising concern about ASD with parents, it is important to refer parents to an early intervention agency on the basis that the child could benefit from a comprehensive developmental evaluation. It is critical that early childhood educators are able to recognise and monitor developmental milestones related to ASD and refer to appropriate early intervention services in a sensitive and timely manner.

Conclusion

Child care and preschool educational professionals are well positioned to help identify developmental and behavioural problems in children (Armstrong & Goldfeld, 2008). Early childhood educators have a strong understanding of early childhood development milestones and tend to fulfil the role of trusted professional in the lives of children and families. With appropriate training and tools, they are well positioned to identify children who could benefit from comprehensive developmental assessment and work with parents to incorporate the insights of early intervention and support in the child's daily life. While recognition, early diagnosis and education of children with ASD are complex issues, successful strategies in identification by early childhood educators can play a pivotal role in promoting outcomes that will benefit children with ASD and their families.

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