Rev J Autism Dev Disord (2017) 4:132–141
DOI 10.1007/s40489-017-0102-8

REVIEW PAPER

# Participation Measures for Preschool Children with Autism Spectrum Disorder: a Scoping Review

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Received: 25 April 2016 / Accepted: 31 January 2017 / Published online: 13 February 2017


**Abstract** The purpose of this scoping review was to identify participation measures for preschool children with autism spectrum disorder (ASD). A comprehensive search strategy was employed across several electronic databases with hand searching of reference lists. Seven measures of participation were identified; five measures had standardization samples that included preschool children with ASD and three provided both validity and reliability data. Each assessment reported psychometric properties and covered a range of developmentally appropriate activities and environments. Parents and professionals can use the identified participation measures to describe participation challenges that exist. However, professionals may need to elicit additional information regarding the impact of repetitive and restrictive interests, interpersonal abilities and novel environments on participation to capture the core challenges of ASD.

**Keywords** Participation · Autism spectrum disorder · Measurement · Scoping review

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## Introduction

Autism spectrum disorder (ASD) is characterized by challenges in social communication and interactions, as well as repetitive behaviours and restricted interests (American Psychiatric Association 2014). Lifelong difficulties encompass many facets of social communicative function including social reciprocity, understanding nonverbal communication, as well as developing and maintaining relationships. Also, repetitive and restricted behaviours, including insistence on sameness, sensory sensitivities and aversion to change, also impact life participation at home, in educational programs and in the community.

Children with ASD and other disabilities may have restrictions that interfere with their frequency of participation, as well as the diversity of their activities. Participation is 'involvement in a life situation' (World Health Organization [WHO] 2007) and can have a positive impact on health and well-being (Law 2002). Participation in meaningful activities is an essential outcome in clinical practice (Hemmingsson and Jonsson 2005), and there is a subsequent need for valid and reliable participation measures (Resnik and Plow 2009) that target children with disabilities. A child's participation in various activities supports the development of their physical, cognitive and communication skills and creates opportunities to make friendships (Hoogsteen and Woodgate 2010; Law et al. 2004; Sylvestre et al. 2013). The construct of participation encompasses the larger context of a child's life by using the collective integration of their functional abilities, developed or regained through rehabilitation that fosters community belonging (Coster and Khetani 2008).

One inherent challenge in measuring participation for children is the ambiguity and complexity of the definition, 'involvement in a life situation' (Coster and Khetani 2008). Coster and Khetani (2008) champion the inclusion of spatial

and temporal dimensions in considering *where* and *when* children are doing the activities that matter to them when assessing participation. The WHO's definition of participation is not developmentally sensitive as young children are deeply embedded in their family's context (Coster and Khetani 2008). It is impossible to separate the child's participation from their family's participation in activities (Coster and Khetani 2008). For the purposes of this review, participation was conceptualized as involvement in life situations that consider where and when these meaningful activities take place. This allows for the review to align within the WHO's framework *The International Classification of Functioning, Disability and Health—Children and Youth version* (ICF-CY; WHO 2007) while balancing the need for developmentally sensitive activities and supportive environments. The ICF-CY considers the dynamic interaction between the individual's body structure and functions, a health condition (i.e. a disorder), their activities, participation and contextual factors (i.e. environmental and personal factors) in life situations.

Even though children as young as 24 months of age can be reliably diagnosed with ASD (Johnson and Myers 2007), the average age for diagnoses is between 3 and 4 years in North America (Burstyn et al. 2010; Daniels and Mandell 2013). The prevalence of ASD in 4-year-old children is 13.4 per 1000 (Christensen et al. 2016). A recent scoping review by Askari et al. (2015) highlights participation patterns of children with ASD across the entire spectrum and the factors that affect these patterns. Of particular importance were factors associated with the core symptoms of ASD (e.g. difficulties with social communication and interpersonal relationships), even for purely physical or recreational activities (Askari et al. 2015). The review identified two studies focused on preschool children with ASD (LaVesser and Berg 2011; Venkatesan 2005) focusing on 'everyday activities' such as sleeping, feeding and school. Ultimately, preschool children with ASD participate in fewer activities compared to typically developing preschool children (LaVesser and Berg 2011), which may have implication for their health and well-being.

Early interventions for preschool children with ASD that target specific tangible improvements (e.g. skill development such as word acquisition, sharing of toys) must be placed within the larger context of participation in life events, which evolve as the child with ASD develops. Measures that support the evaluation of how children with ASD participate in the day-to-day activities of family and community activities within life situations have not yet been identified and reviewed in a systematic way.

### Rationale and Aim of the Review

The primary goal of current treatments for ASD, particularly early intervention, is to improve participation at home, in the community or at early education programs. Thus, participation measures that support the selection of meaningful goals and outcomes for a pre- and post-delivered treatment plan for preschool children with ASD in a variety of activities in real-life settings are important.

Presently, little is known about the measurement of participation of preschool children with ASD who are at a critical time in development for involvement with peers and the community. Previous reviews of participation measurements have focused on cerebral palsy (Morris et al. 2005; Sakzewski et al. 2007), acquired brain injury (Ziviani et al. 2010), hand use (Chien et al. 2013) or disabilities generally (Adolfsson et al. 2011; Chien et al. 2014; Phillips et al. 2013). None have focused on ASD or preschool children with disabilities, yet the reviews are useful for identifying the breadth of measures available. The aim of the scoping review was to determine what participation measures are available for use with preschool children with ASD.

## Method

Scoping reviews are 'a rapid review' for the purposes of identifying research gaps and providing findings for policy or service provision (Anderson et al. 2008; Arksey and O'Malley 2005). Selection of a scoping review methodology for this study was appropriate to gain insights into a relatively under-studied area (i.e. participation in preschool children with ASD) to inform clinical decision-making. Participation measures are likely the most appropriate clinical tools to evaluate the combination of interventions across complex, naturalistic settings that are provided to preschool children with ASD. This review followed the methodology proposed by Arksey and O'Malley (2005), with subsequent steps based on the recommendations by Levac et al. (2010).

### Identifying Relevant Studies

Studies were from 1990 to April 30, 2014 as the previously listed participation disability reviews found no literature prior to 1990. Based on Arksey and O'Malley (2005), the following were searched: (1) electronic databases (including CINAHL, Embase, Health and Psychological Instruments [HAPI] and Medline) using the search terms 'participation' AND 'measure OR assessment OR outcome measure' AND 'child* OR p*ediatric*' AND 'disabilit*'; the selection of these search terms and databases was done with the consultation of a health sciences librarian; (2) reference lists of previous reviews (Adolfsson et al. 2011; Chien et al. 2013, 2014; Morris et al. 2005; Phillips et al. 2013; Sakzewski et al. 2007; Ziviani et al. 2010); (3) key electronic journals (i.e. *Disability & Rehabilitation*, *Autism*, *Developmental Medicine & Child Neurology*); (4) publications of professional networks (e.g. *American Occupational Therapy Association*, *International*

*Society of Autism Research*) and relevant organizations (e.g. *CanChild*); and (5) conference abstracts (e.g. *International Meeting for Autism Research*). Databases were selected in conjunction with a health sciences research librarian, covering the breadth of published literature within paediatric rehabilitation on participation. Using the same terms and databases, a search covering May 1, 2014, to April 20, 2016 was run to identify any additional articles addressing participation measures in preschool children with ASD to ensure the scoping review presented within was as updated as possible prior to publication. Four reviews, one new assessment and five articles further validating previously identified measures were located.

Levac et al. (2010) recommended that the purpose should guide decision-making, including selection of a suitable team and, when possible, to limit scope and justify the reasons. Our team had expertise in ASD, childhood disability, measurement and participation. The difficulties in conceptualizing and measuring participation have been well documented (Law 2002); therefore, measures had to report a definition of participation that was consistent with the WHO and developmentally sensitive to preschool children, as recorded by the two reviewers.

### Study Selection

Inclusion and exclusion criteria were applied to all measures. To be included in the review, the measures had to meet the following criteria: (1) available in English; (2) used with preschool children (5 years old or younger); (3) had a specific focus on children with ASD, or a broad focus on children with disabilities including those with ASD, or functional/behavioural descriptions consistent with ASD (e.g. sensory sensitivities, social communication challenges, difficulties managing behaviours); and (4) reported at least one psychometric property (e.g. reliability, validity). Articles were excluded if they (1) focused only on children over 5 years old ($n = 39$) or (2) focused exclusively on children with physical disabilities ($n = 4$). Abstracts, summaries and titles were reviewed to determine if the publication might fit the criteria, and merit a review of the whole document. Fifty-seven articles were read in full, covering 35 measures and 7 related reviews as part of the scoping review (see Fig. 1). After review of the 35 measures, two reviewers had 94% agreement on whether measures should be included or excluded (i.e. 33 of 35), with 6 measures recommended for inclusion and 27 for exclusion. A third blind reviewer resolved disagreements over the remaining two measures, resulting in their exclusion. The 2016 search added one additional measure. Previous reviews (including those that exclusively focused on specific neurological or development disabilities) had potential overlap in content areas and were retained for relevance and understanding of the participation measurement field.

### Charting the Data

Two reviewers jointly developed the data extraction form for collecting relevant aspects of each measure across the following areas: behaviour difficulties, sensory challenges, social participation, peer relationships, familiarity of individuals or the setting, use of an aide in the activity and the structure (i.e. routine) provided in the environment and for transitions. Each measure was reviewed using the structured form (described above) to record the measure's activity type, contextual factors and respondent type. The development of a structured form by reviewers was an iterative process that allowed for flexibility and comprehensiveness in data extraction (Colquhoun et al. 2014). In the form development, the reviewers considered the core diagnostic features of ASD (e.g. restrictive and repetitive behaviours) and the ICF-CY framework (e.g. peer relationships, environmental supports). In addition, the primary author extracted relevant information regarding reliability and validity as reported for each measure.

## Results

The scoping review identified seven measures with potential use for preschool children with ASD although the recommended age range varied across measures and often involved children with motor delays or those with an 'injury of insult' post-birth. The seven measures were (1) *Assessment of Preschool Children's Participation* (APCP; Law et al. 2012), (2) *Child and Adolescent Scale of Participation* (CASP; Bedell 2004, 2009), (3) *Children's Assessment of Participation with Hands* (CAPH; Chien et al. 2015), (4) *Children's Participation Questionnaire* (CPQ; Rosenberg et al. 2010), (5) *Matrix for Assessment of Activities and Participation* (MAAP; Castro and Pinto 2015), (6) *Preschool Activity Card Sort* (PACS; Berg and LaVesser 2006; LaVesser and Berg 2011) and (7) *Young Children's Participation and Environment Measure* (YC-PEM; Khetani et al. 2015.

**Purpose** As an essential component of the ICF-CY, activity was seen as an important sub-category to explore for preschool children with ASD with respect to the purpose of the participation assessment. All activities in the seven measures were developmentally appropriate for preschool (and in some cases, school-aged) children and included play, active or physical recreation and social activities with family members or community peers. Given that preschool children require some assistance and supervision, all measures expected some dependence when completing activities. The CAPH and CPQ explored independence level, which is the degree of support or degree of assistance a child typically needs to participate in an activity. The CAPH, APCP, CPQ and YC-PEM assessed

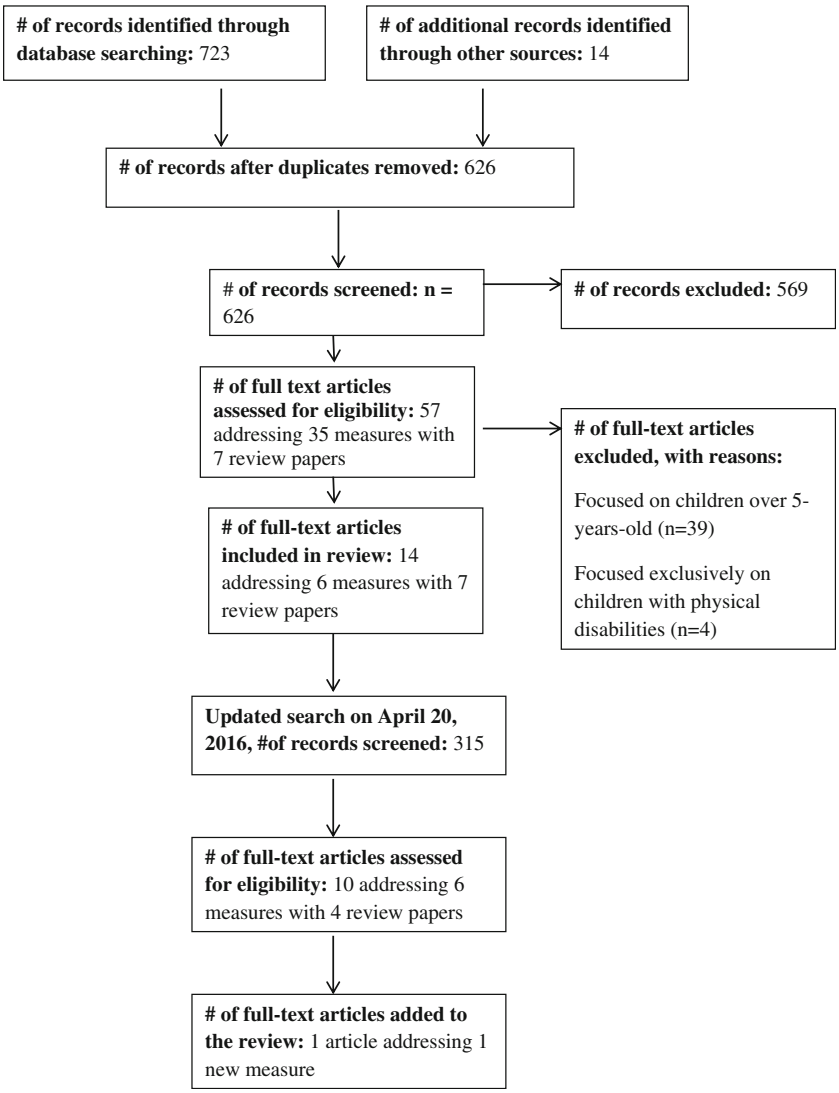


**Fig. 1** Selection of articles describing measures for inclusion in the review

activity diversity and intensity/frequency based on the relative amount of time spent on an activity and the CPQ measured performance skills. Desire for change in activity participation was assessed in CAPH and YC-PEM. Also, all measures addressed more than one environment, typically focusing on home and community settings. Only the YC-PEM specifically elicited facilitators and barriers across specific settings including home, daycare/preschool as well as considering specific aspects of each environment such as the physical layout or sensory qualities. Other measures inquired about the activities a child does and does not participate in and why, which may be related to environmental demands.

**Client Age and Respondent Type** The majority of the assessments focused on preschool children under 6 years old (i.e. APCP, CAPH, CPQ, MAAP, PACS, YC-PEM). The CASP was the only measure with a broader age range from 3 to 22 years, with a 10% sample of children under 6 years old. All measures utilized parent report via interview or questionnaire, except the MAAP, which utilized professionals' responses, based on child observation in a daycare/preschool setting. The *MAAP* does not elicit family values or perspectives on participation, which are most important for the child's involvement.

**Type of Scale Used** All measures used at least one ordinal scale (ranging from 4 points to 8 points). Nominal scales were also used in conjunction with ordinal scales for four measures (i.e. APCP, CASP, CPQ and YC-PEM), and open-ended questions were explicitly described in an additional two measure (i.e., CASP, YC-PEM).

**Psychometrics** As summarized in Table 1, all measures reported some psychometric properties (either validity *or* reliability). Only the CAPH, CPQ and YC-PEM reported both.

The APCP had moderate to very good internal consistency for the diversity scale ($\alpha = 0.73$ to 0.85) and the intensity scale ($\alpha = 0.52$ to 0.70). For construct validity, significant

**Table 1** Summary of participation measures for preschool children with autism spectrum disorder (ASD)

| Measure | Purpose | Client age and respondent type | Type of scale used | Psychometrics | Utility with preschool children with ASD | Constructs measured considered important for preschool children with ASD |
|---|---|---|---|---|---|---|
| Assessment of Preschool Children's Participation (APCP) (Law et al. 2012) | Evaluates diversity and intensity of participation in day-to-day activities (play, active/physical recreation, social) | Ages = 2 to 5–11. Parent-report questionnaire | Nominal scale (yes or no) if child participates. Ordinal scale (7 points) on frequency of participation | Internal consistency—diversity, $\alpha = 0.73$ to 0.85; intensity, $\alpha = 0.52$ to 0.70 Construct validity—hypothesis testing against literature. Effect sizes—medium to large Reliability—NR | $N = 120$ (71 males) All had CP. Several also had DD—50.8%, vision impairment—35%, seizure disorder—25%, learning disorder—12.5% | • Participation • Peer relationships • Support from environment |
| Child and Adolescent Scale of Participation (CASP) (Bedell 2004, 2009) | Measures participation in home, school and community compared to TD children | Ages = 3 to 22 (10% < 6) Parent-report questionnaire | Ordinal scale (4 points) on degree of supervision or assistance of participation compared to TD peers Open-ended questions about factors that influence participation | Construct validity—Rasch analysis, a unidimensional construct Internal consistency—high ($\alpha = 0.96$) Reliability—NR | $N = 313$ (173 males) TD—17% Acquired brain injury—56% DD (including ASD)—19% Learning/attention/sensory impairment—8% | • Participation • Peer relationships • Structure of environment |
| Children's Assessment of Participation with Hands (CAPH) (Chien et al. 2015) | Measures hand-use participation in self-care, recreational, educational, and domestic and community life domains | Ages = 2 to 12 Parent-reported questionnaire | Nominal scale (yes or no) if child participates Ordinal scale (5 points) on frequency of participation Ordinal scale (4 points) on degree of assistance | Internal consistency—0.72 to 0.78 for most scales/domains, except for participation diversity (0.34–0.64) in all domains, frequency (0.31) in self-care domain and desire for change (0.55) in domestic and community life domain Reliability—test-retest: ICC 0.69–0.96. | $N = 202$ (123 males) TD—52% Disabilities—48%; included ASD ($n = 42$), intellectual/-developmental delays, language/speech delay, learning disability, Down syndrome, physical disability, hearing/visual impairment | • Participation • Peer relationships |
| Children's Participation Questionnaire (CPQ) (Rosenberg et al. 2010) | Measures participation in everyday activities. Activity rated on intensity, independence level, enjoyment, parent's satisfaction | Ages = 4 to 6 Parent report via questionnaire | Nominal scale (yes or no) if child participates Ordinal scale (5 points) on participation intensity Ordinal scale (6 points) on participation assistance Ordinal scale (6 points) on child's enjoyment Ordinal scale (6 points) on parent's satisfaction | Construct validity—moderate to high correlations Convergent and divergent validity—correlations with Vineland Adaptive Behaviour Scales and CPQ Reliability—Cronbach's alpha = 0.79 to 0.90. Test-retest: ICC = 0.84–1.00 | $N = 480$ (390 males) TD—52% Disabilities—48%; included DD, motor delays, visual motor difficulties, sensory sensitivities, attention deficits and learning deficits | • Participation • Peer relationships • Availability of aide |
| Matrix for Assessment of Activities & Participation (MAAP) | Examines functional abilities of children | Ages = 3 to 6 | Ordinal scale (5 points) on child's developmental level of participation | Validity—NR Internal reliability—Cronbach's alpha = 0.98 | $N = 66$ (sex not reported) TD—33% ASD—33% | • Participation • Peer relationships |

**Table 1** (continued)

| Measure | Purpose | Client age and respondent type | Type of scale used | Psychometrics | Utility with preschool children with ASD | Constructs measured considered important for preschool children with ASD |
|---|---|---|---|---|---|---|
| (Castro and Pinto 2015) | with ASD, DD or TD in different routines | Observational by teacher or regulated health care professional | Ordinal scale (6 points) on levels of disability severity | | Other disabilities—3%<br>Compared to TD children, significant differences in pattern of abilities in most ICF-CY domains | |
| Preschool Activity Card Sort (PACS) (Berg and LaVesser 2006; LaVesser and Berg 2011) | Participation in everyday activities<br>Parent interviewed by using activity photographs—asked if child participates; if not, why | Ages = 3 to 6<br>Parent report via interview | Ordinal scale (4 points) if child participates in activity and if with additional assistance | Content validity—established<br>Reliability—NR | *N* = 68 (32 males), TD<br>Follow-up study: ASD (*n* = 103) vs. TD (*n* = 41). ASD children—fewer activities in self-care, community mobility, vigorous and sedentary leisure, social interactions, chores, education | • Participation<br>• Peer relationships |
| Young Children's Participation & Environment Measure (YC-PEM) (Khetani et al. 2015) | Includes 3 participation scales and 1 environment scale. Range of activities and environmental features that support or hinder participation | Ages = birth to 5<br>Parent report via interview or electronic survey | Ordinal scale (8 points) on frequency of participation<br>Ordinal scale (5 points) on level of involvement<br>Nominal scale (yes or no) on desire for change<br>Open-ended questions about strategies used to increase participation | Construct validity—differences by disability status. Association between participation and function<br>Internal consistency—participation (0.68 to 0.96); environment (0.92 to 0.96)<br>Test-retest—participation scales, 0.31–0.93; environment scale, 0.91 to 0.94 | *N* = 395 (222 males)<br>TD—76%<br>24% had disability based on deficits in communication (71.2–74.2%), controlling behaviours (57.1–62.1%); managing emotions (57.1–59.1%), reacting to sensations (55.2–61.2%) | • Behaviours (such as insistence on sameness)<br>• Participation<br>• Peer relationships<br>• Support from environment<br>• Availability of aide |

*ASD* autism spectrum disorder, *CP* cerebral palsy, *DD* developmental disabilities, *ICC* intraclass correlation coefficient, *ID* intellectual disability, *MD* muscular dystrophy, *PDD* pervasive developmental delay, *LD* learning disability, *TD* typically developing; *ICF-CY* International Classification of Functioning, Health and Disability—Child and Youth version (World Health Organization 2007); *NR* not reported

[a] Parents reported multiple disabilities

differences exist between children under 4 years old and those over 4 years old in both scales; older children had more diversity in their activities and higher participation intensity. Also, significant differences existed for children by the Gross Motor Function Classification System (GMFCS) as children with levels I–III had a greater range and higher frequency of activities than those in levels IV–V with a large effect size. Also, positive moderate to strong correlations exist between self-care and mobility independence and diversity and frequency of participation.

For the CASP, children under 6 years old were most likely to have lower scores and had positive correlations with the Pediatric Evaluation Disability Inventory (PEDI). Thus, children with higher PEDI scores of functional skills had higher participation scores in the CASP. High internal consistency was explored for 'extent of age-expected participation' for participants who answered all items as applicable ($\alpha = 0.98$).

For the CAPH, test-retest was moderate to high (intraclass correlation coefficient (ICC) 0.69–0.96) except for the desire to change scale in the recreational domain (ICC 0.40). The average number of days between test-retest was 26.7 ± 12.8 days. Also, using a Rasch-based person reliability analysis, the internal consistency was acceptable (0.72–0.78) for most domains and dimensions, except participation diversity in all domains (0.34–0.64), frequency in self-care (0.31) and desire for change in domestic life and community domain (0.55).

For the CPQ, good internal reliability was demonstrated ($\alpha = 0.79$–$0.90$) as well as test-retest (ICC 0.84–1.00) by administering the measure twice in a 2-week interval. Construct validity had moderate to high correlations and convergent and divergent validity was supported. Significant differences existed between children with and without disabilities as well as age groups and socio-economic status of children.

For the MAAP, very good internal consistency was established ($\alpha = 0.98$) for all participants; when excluding typically developing children, very good internal consistency was maintained ($\alpha = 0.96$). Validity was not reported for the MAAP.

For the PACS, content validity was established by 10 paediatric occupational therapists and 10 parents of typically developing preschool children from across Canada reviewing the measure. For occupational therapists, 57 photographs were 'accepted', 14 were identified as 'duplicates', 10 were reported as 'unclear', 7 identified as 'not for preschoolers', 7 as 'poor quality' and 14 suggestions for other (new) activities. For parents, 58 photographs were 'accepted', 10 were identified as 'intent unclear', 5 were reported as 'not for preschoolers' and 5 were suggestions for other (new) activities. Reliability was not reported.

For the YC-PEM, all participation scales demonstrated acceptable levels of internal consistency except for the following items: (i) *desire to change in preschool school settings* and (ii) *frequency of participation in community activities*. Test-retest reliability was reported by the following scales: (1) the *frequency scale* was fair to good in home and the community (ICC 0.59–0.69) but not in the daycare/preschool setting (ICC 0.31), (2) the *level of involvement scale* was excellent (ICC 0.78–0.93) and (3) the *environmental support scale* was excellent (ICC 0.91–0.94). Construct validity was demonstrated for the YC-PEM and differed on all participation scales and the environmental scale by disability status. Validity and reliability remain important components in the selection of rigorous measures of participation for all children.

**Utility for Preschool Children with ASD** Of the five measures that included children with ASD as part of their standardization sample, the CAPH was evaluated using the largest sample ($n = 42, 21\%$), followed by the MAAP ($n = 22, 33\%$). The CAPH focused on participation in life situations requiring hand use, which may impact social participation. The MAAP provided a distinct profile of participation associated with ASD, and participation was strongly linked to functional abilities. Participation patterns differed significantly from age-matched children with other disabilities or typical development. Two measures (CPQ, YC-PEM) did not explicitly state the diagnostic groups targeted and included a wide range of functional issues (e.g. learning difficulties, difficulty controlling behaviours, sensory sensitivities) that may fall within the category of ASD. This functional, non-diagnostic specific approach may have implications for capturing participation within a wide range of abilities similar to and including preschool children with ASD. This may include preschool children with an elevated family risk of ASD, or some emerging challenges in social skills who are subsequently referred for early intervention without a diagnosis. Based on PACS scores, 103 preschool children with ASD had lower participation compared to 41 typically developing preschool children, including social interactions. Other measures were developed for one particular neurodevelopmental diagnosis such as acquired brain injury (CASP), although a portion of the sample had ASD or only had published data for children with a physical disability (including co-morbid conditions, such as a learning disability) which may have implications for preschool children with ASD (APCP, Dutch version; Bult et al. 2013).

**Constructs Measured Considered Important for Preschool Children with ASD** The constructs most likely to be reported within the measures considered important for preschool children with ASD were as follows: (1) *participation* (7/7 of measures) and (2) *peer relationships* (7/7 of measures). Additional constructs considered important were (1) *structure of the environment* (3/7 of measures), *availability of an aide* (2/7 of measures) and *behaviours* (e.g. *insistence on sameness*) (1/7 of measures). No measures reported on *familiarity* (0/7 of measures) as an important

consideration for preschool children with ASD within the participation measures.

## Discussion

The purpose of this scoping review was to identify participation measures for preschool children with ASD. Prior reviews helped place our scoping review within the broader childhood disability literature although they were primarily for school-aged children or adolescents with disabilities in general. In total, seven participation measures were located in this review that have been used with preschool children with ASD. Three measures were part of prior reviews but four were new. Each measure was reviewed for its (*i*) client age and respondent type, (*ii*) type of scale used, (*iii*) psychometrics and (*iv*) utility for preschool children with ASD.

**Client Age and Respondent Type** As expected for preschool children, the majority of measures used a proxy (i.e. parent) as the primary respondent and one measure used professional or educator observation (i.e. MAAP). Given that parents are the primary persons involved in the care of the preschool child, especially for enrolment and coordination of activities, their perspectives are essential in the measurement of participation. Previous reviews identified child report for the majority of participation measures for older children with disabilities, although over half of the identified measures used proxy report (Chien et al. 2013).

**Type of Scale Used** All measures used an ordinal scale (ranging from 4 to 8 points on a Likert scale) for a variety of constructs, including frequency or intensity, degree of supervision or assistance, child's enjoyment, child's level of involvement, child's developmental level of participation or disability severity and parent's satisfaction with the child's participation. This allows for all measures to capture the respondent's response in a valid, consistent manner congruent with the individuals' beliefs or observations (Wang et al. 1999). Participation scales for school-age children and adolescents with disabilities (Chien et al. 2013) also used ordinal scales.

**Psychometrics** Psychometric properties such as reliability and validity are important considerations when selecting a measure of participation. For example, if measuring changes over time, the assessment needs to have good test-retest reliability to ensure that changes identified are due to interventions and not to poor test-retest reliability. Similarly, a measure should be internally consistent with all items on an assessment measuring the same general construct of participation. Three of the seven measures did not report reliability information and one did not report validity information. No measures reported psychometrics specifically for preschool children with ASD. The MAAP provided evidence that unique participation profiles exist for preschool children with ASD (Castro and Pinto 2015), but psychometrics exclusively for ASD were not reported. The CAPH, CPQ and YC-PEM reported aspects of validity and reliability for clinicians to use when measuring participation in a variety of settings. Future research should address the missing psychometric information that is needed in order to ensure the measures are suitable for their stated purpose and to increase confidence in their use.

**Facilitators and Barriers Unique to ASD** While the results of this review are encouraging for practice, it must be noted that none of the measures explicitly evaluated the impact of restricted and repetitive behaviours, a core symptom of ASD, on participation. For example, a child's fixation on 'spinning wheels' is a repetitive and restricted behaviour that impairs the ability to 'play together' with peers, creating restrictions in non-solitary play activities. This may be best captured by parent report under categories such as 'diversity of activities' or as a 'desire for change'. For example, in the YC-PEM, families are able to express their desire for the child to participate in more cooperative games or activities in an interactive manner.

Familiarity as a contextual factor of participation was not addressed by any of the seven measures. A preschool child with ASD may have all the functional abilities for an activity and can do the activity with a familiar peer or sibling but may be unable to do so with a new peer or in a novel environment. Another aspect of context is the competency (or skill set) and familiarity of the child's aide. None of the measures included formal questions addressing this aspect. A familiar aide may be needed to successfully support participation in familiar activities and then support the child in transferring these skills into a new environment. This may be an important component for future measures specific to participation in preschool children with ASD.

**Utility for Preschool Children with ASD** This review supports the consideration of what participation barriers and facilitators may be elicited that are *unique* to ASD (e.g. restrictive and repetitive behaviours) but also potentially similar to other preschool children with disabilities (e.g. availability of an aide). The only measure that was developed *exclusively* for preschool children with ASD was the MAAP. However, its authors argue that a *functional* approach versus a *diagnostic* approach better serves the developmental needs of preschool children with disabilities in profiling participation abilities. Thus, the MAAP has utility also for preschool children without ASD such as preschool children demonstrating developmental delays. The other measure that focused on the need for a functional, not diagnostic specific, profile of preschool children was the YC-PEM, reporting behavioural difficulties rather than diagnoses. This may reflect the shared challenges of

many disabilities (e.g. social difficulties, sensory sensitivities) with ASD.

When considering activities for measuring participation, preschool children with ASD may have a unique participation profile particularly related to social activities that involve peers. As a preschool child develops, the demands of following social norms and rules increase across self-care, school/work-related and leisure domains. While playground activities, such as running and climbing, may be considered physical in nature, there are also many social demands in these activities that can be challenging for preschool children diagnosed with ASD (Little et al. 2014). Early interventionists can utilize the measures identified in our review to gain a holistic participation profile of a child to guide early intervention aimed at improving participation in activities with peers. Understanding a child's abilities at an activity level, and the required integration of different skills (e.g. requesting, turn-taking and imitation), can highlight goals to work on in a naturalistic setting. It is also relevant to understand the social demand of the activity as well as the child's environment, such as available support personnel, amount of noise/light, social expectations and peer attitudes, that may restrict or facilitate participation—all measured by the YC-PEM.

In general, early intervention teams use multiple modalities to globally focus on the acquisition of social, physical, emotional and social skills that focus on client- and family-centred participation goals in activities at home, preschool or community settings. Modalities may include sensory regulation strategies, behavioural modification, assistive communication technologies and caregiver-mediated training models all with the end goal of enhancing participation and engagement in a variety of activities in real-life settings. For example, understanding how participation goals are achieved is important to support socially valid outcomes for preschool children with ASD, such as being in a community soccer league or attending a birthday party. In the community soccer league scenario, the YC-PEM may elicit several environmental barriers that exist, in addition to several activity-level difficulties in participation with peers. In comparison to the birthday party scenario, a clinician may elicit from a parent specific difficulties with a component of an activity related to hand use by using the CAPH (e.g. has difficulties with the toys such as blocks) that may create issues with social participation and involvement. Both of these examples demonstrate the use of participation measures in life situations that may be addressed or modified to achieve a child's and family's desired participation in a community event.

## Limitations

This scoping review focused on preschool children with ASD and aimed to provide a comprehensive, systematic search of participation measures for these children. Given a scoping review's methodology, the review is limited in rigour, has the potential for bias and has no formal quality assessment of the studies (Grant and Booth 2009). However, scoping reviews provide a preliminary appraisal of the literature and measures, as is appropriate with emerging areas of research, such as participation measurement in preschool children with ASD. Future research could explore the impact of repetitive and restricted behaviours on a child's participation and review measures intended for older children with ASD across environments.

## Conclusions

Although participation in a variety of activities is a worthwhile goal for preschool children with ASD, the measurement tools available to determine progress towards this goal remain limited. The findings of this review add to the research currently available on participation measures available to measure socially validated outcomes for preschool children with ASD, as well as explore barriers and facilitators that exist in a child's ability to participate in the community. More in-depth research related to the use, cross-cultural validation and evaluation of participation as a broad primary outcome measure is needed. By identifying and reviewing appropriate participation measures for preschool children with ASD, clinicians can be informed about the available validated and reliable measures available in practice to set and monitor client- and family-centred participation goals.

**Acknowledgements** TY was supported by the Autism Research Training program, Canadian Child Health Clinician-Scientist Career Enhancement Program, Alberta Innovates Health Solutions Clinician Fellowship Award, Autism Society of Edmonton Area and Autism Research Centre Graduate Student Pilot Grant and Women and Children's Health Research Institute Graduate Studentship. LARS was supported by the Alberta Innovates Health Solutions Post-Doctoral Fellowship Award. LZ was supported by the Stollery Children's Hospital Foundation Chair in Autism.

**Compliance with Ethical Standards**

**Conflict of Interest** The authors declare that they have no conflict of interest.

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