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The Molteno Adapted Scale: A child development screening tool for healthcare settings

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The Molteno Adapted Scale (MAS) is a developmental screening tool for children up to five years of age, used by medical practitioners in the Western Cape, South Africa. It generates subquotients for language, personal and social, fine and gross motor domains. The general quotient is the average of all four subquotients, with a score < 85 indicating risk for global developmental delay. The authors aimed to determine the concurrent validity of the MAS, using the Bayley Scales of Infant and Toddler Development-3rd edition (BSID) as a comprehensive assessment reference measure. A total of 103 (55 girls) participants were enrolled from a longitudinal cohort study, of which 90 (49 girls) were assessed on both the MAS and BSID at 11–14 months, 53 (27 girls) at 30–42 months of age and 44 (21 girls) at both timepoints. The low number of developmentally delayed children precluded estimation of diagnostic accuracy of the MAS. Therefore, the authors determined Pearson correlation coefficients (r) for the MAS and BSID across similar domains at 11–14 months (n = 90) and 30–42 months (n = 53) and used the Bland–Altman analysis to detect bias between the MAS and BSID domain scores. Correlation was moderate to high between MAS and BSID domains, except for fine motor in 1-year-olds (r = 0.23), but Bland–Altman analysis found discordance especially between the MAS and BSID language and motor scores at the upper and lower performance ranges. Future studies should aim to standardise the operational procedures of the MAS, validate it across a wider age-range, and include children with varying degrees of delay.

Keywords: Molteno Adapted Scale; developmental delay; developmental screening; paediatrics; children; infants; Bayley Scales of Infant and Toddler Development-3rd edition; child development.

Introduction

There is a need for child development assessment tools (CDAT) in low- and middle-income countries (LMICs), which can be used to screen and comprehensively assess children for delay in both clinical and research contexts (Sabanathan et al., 2015). As access to psychologists is limited in LMIC settings (Berger, 2013), healthcare professionals including general and specialist clinicians are best positioned to detect developmental problems in infancy and early childhood. In South Africa, developmental and community paediatricians are often tasked with referring children for specialised intervention and educational placement. In these situations, it is vital not to wrongly classify children with intellectual difficulties but it is equally important not to miss disability that would benefit from intervention (Luiz et al., 2004).

The Molteno Adapted Scale (MAS) is a developmental screening tool for young children, aged 6 weeks to 5 years (Molteno, 1989). It was conceptualised by Professor Christopher Molteno, a developmental paediatrician at the Red Cross War Memorial Children's Hospital in Cape Town, South Africa and details of its origins and subsequent adaptations have been described previously (Honeth et al., 2019). The tool was designed for use by developmental and community medical practitioners working in public health clinics with resource constraints. It is time-efficient and cost-effective; the assessment takes less than 15 minutes, uses limited equipment and does not require a certified training course or licensing fees, thus a useful tool for low- and middle-income settings. Unlike most screening tools, the MAS generates a general quotient (GQ) and developmental subquotients in the gross motor, fine motor, language and personal and social domains, thus quantifying delay in specific areas. Change in quotients over time can be used to track longitudinal developmental trajectories. There has been limited research regarding the use of the MAS as a developmental screening tool (Honeth et al., 2019; Laughton, 2010). A recent study

comparing the MAS with the Griffiths Mental Development Scale-Extended-revised (GMDS-ER) in a cohort aged 17–23 months, showed adequate diagnostic accuracy to justify its regular use in South African toddlers (Honeth et al., 2019), recommending that MAS GQ scores less than 83 (vs. 85) represented children 'at risk' for global developmental delay. The scarcity of psychometric data on the MAS limits its use both as a clinical and research tool and provided the rationale for this concurrent validity study.

Establishing validity of a screening tool requires use of a suitable reference assessment measure. The Bayley Scales of Infant Development (first two editions) has been widely used in South Africa (Richter & Grieve, 1991) and the 2nd edition was found to be predictive of 'at-risk' status for late school entry in South African children (Richter et al., 2015). The Bayley Scales of Infant and Toddler Development-3rd edition (BSID), was standardised on a North American population (Bayley, 2006). This comprehensive diagnostic tool includes cognitive, language and motor scores. It has been applied globally as a gold standard in relation to evaluating screening tests and was previously used in this manner to assess three screeners in a low-income region of Columbia (Rubio-Codina et al., 2016).

The authors, therefore, aimed to evaluate the concurrent validity of the MAS, including gender differences, and temporal stability over two timepoints by using the BSID as a reference assessment measure.

Materials and methods

Study design and participants

This neurodevelopmental study was nested in the Mother Infant Health Study (MIHS), a prospective longitudinal observational cohort study, primarily designed to compare infectious morbidity in HIV-exposed uninfected and HIV-unexposed infants from a socioeconomically disadvantaged community (Slogrove et al., 2017). Infants were enrolled in the MIHS from a low-risk midwife obstetric unit at birth and recruited for the neurodevelopmental study at 11–14 months of age. Inclusion criteria included birth weight more than 2000 g, gestation more than 34 weeks with no perinatal complications or congenital neurological conditions. Children with a change in caregiver over the preceding 6 months were excluded. In total, 103 participants (55 girls) were enrolled in the neurodevelopmental study, of which 90 (49 girls) were assessed on both the MAS and BSID at 11–14 months, 53 (27 girls) at 30–42 months of age and 44 (21 girls) at both timepoints. There were relatively few children with significant developmental delay according to the BSID scores in the MIHS cohort (Springer et al., 2018; Springer et al., 2020), but children with and without delay were included.

Assessments and measures

Participants were tested on both the BSID and MAS at two timepoints, that is at 11–14 months and at 30–42 months. The MAS and BSID were administered on the same day, but an effort was made to alternate the sequence of the assessments and testing was discontinued if the child was uncooperative. Two developmental paediatricians (P.S. and H.S.) initially completed five assessments together to establish consensus on administration and scoring. A total of 138 (97%) of the total BSID and MAS assessments were performed by the first tester (P.S.), while five (3%) of the '1 year' BSID and MAS assessments were carried out by the second tester (H.S.).

The MAS is a developmental screening tool, with items originally derived from the GMDS (Griffiths, 1970) and other developmental screening tools. It encompasses an age range from 6 weeks to 5 years, and includes gross motor, fine motor, language (communication) and personal and social subscales. A developmental age equivalent is obtained from the assessment sheet (Molteno, 1989) and subscale subquotients are estimated by dividing the developmental age on each subscale by the chronological age, expressed as a percentage or standard score. The MAS GQ is calculated by averaging the four subquotients. A MAS GQ less than 85 indicates 'risk for global developmental delay'; developmental delay is further classified as mild (GQ > 50 – < 70) moderate (GQ > 30–50) and severe (GQ < 30).

The BSID is a comprehensive developmental assessment tool, which provides discrete cognitive, language and motor composite scores (Bayley, 2006). It also produces separate scaled scores to discriminate between receptive and expressive language, as well as fine and gross motor delay. Unlike the MAS and GMDS, the BSID does not generate a combined GQ. The U.S. norms classify a child with a BSID domain composite score less than 85 as 'at risk for' developmental delay, while a score below 70 is classified as severe delay.

Statistical analyses

Data were analysed using SPSS version 25 (IBM Corp. Released 2017). IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Continuous variables were described using mean and standard deviation (SD) if symmetrically distributed; otherwise, the median and inter-quartile range were used. Performing both parametric and non-parametric tests yielded results that were similar, hence for consistency, the decision was taken to use Pearson correlation for preliminary analysis. Thus, the linear associations between the MAS (including GQ, gross and fine motor and language subquotients) and comparable domains on the BSID (including cognitive and language composite scores, gross and fine motor sliding scores) were explored using Pearson correlation coefficient. There was no comparable BSID domain to correlate with the MAS personal and social subscale as the BSID adaptive subscale was not used. The authors considered $r > 0.6$ as strong, 0.3–0.6 as moderate and < 0.3 as weak degrees of correlation. However, as the Pearson correlation coefficient does not detect differences between measures, the Bland–Altman analysis was used for secondary analysis to detect bias between scales when comparing similar BSID and MAS domains that is

gross motor, fine motor and language domain scores (Giavarina, 2015). The independent *t*-tests were used to determine sex differences in performance on the MAS.

Ethical considerations

The Health Research Ethics Committee complies with the SA *National Health Act* No. 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki and the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles, Structures and Processes 2015 (Department of Health). Ethical clearance number: S16/03/041.

TABLE 1: Performance on the Bayley Scales of Infant and Toddler Development-3rd edition and Molteno Adapted Scale at 11–14 months (n = 90) and 30–42 months (n = 53).†

Age at assessment	11–14 months		30–42 months	
	Mean score	SD	Mean score	SD
Results of Bayley Scales of Infant and Toddler Development-3rd edition				
Domain	-	-	-	-
Composite cognitive score	100.5	10.2	88.3	6.2
Composite language score	91.2	10.1	90.4	7.4
Fine motor scaled score	9.6	1.4	9.5	1.7
Gross motor scaled score	9.2	2.3	8.6	1.7‡
Composite motor score	96.5	1.4	94.5	8.2‡
Results of Molteno Adapted Scale				
Gross motor subquotient	93.7	6.8	96.0	8.9
Fine motor subquotient	93.6	9.3	88.2	13.3
Language subquotient	94.1	10.1	90.7	13.6
Personal and social subquotient	99.4	6.4	91.2	5.1
General quotient	95.2	5.7	92.2	8.3

†, Forty-four participants had assessments at both timepoints.

‡, One value missing.

SD, standard deviation.

TABLE 2: Number (percentage) of Molteno Adapted Scale and Bayley Scales quotients below 85 signifying developmental risk at the 11–14 months (n = 90) and 30–42 months (n = 53) visits.

Number (%) quotients < 85	11–14 months visit		30–42 months visit	
	n	%	*n*	%
MAS general quotient	3	3	16	30
MAS gross motor	1	1	2	2
MAS fine motor	2	2	16	30
MAS language	21	22	13	26
MAS personal and social	0	0	7	13
BSID motor	3	3	6	11
BSID language	23	24	12	20
BSID cognitive < 85	5	5	8	15

MAS, Molteno Adapted Scale; BSID, Bayley Scales of Infant and Toddler Development-3rd edition.

Results

A total of 90 participants (49 girls) aged 11–14 months (timepoint 1) and 53 participants (27 girls) aged 30–42 months (timepoint 2) completed both BSID and MAS assessments, while 44 participants (21 girls) had assessments at both timepoints. Results at the two timepoints for both BSID and MAS assessments are shown in Table 1. An MAS GQ below 85 signifies risk of global developmental delay and a domain subquotient < 85 risk for specific delay.

Table 2 shows the number of children found to be at risk of developmental delay on both the BSID and MAS. Three children (3%) children had a MAS GQ less than 85 at the 11–14 months visit and 16 (30%) children at the 30–42-months visit, indicating risk of global developmental delay (Table 2). The MAS and BSID 1-year language subquotients included the highest number of 'at risk' scores. The BSID language scores ranged from 59 to 118 and MAS from 57 to 118 at the first timepoint. A greater percentage of children were 'at risk' of motor, language and cognitive domains at the 30–42 months visit than at 11–14 months.

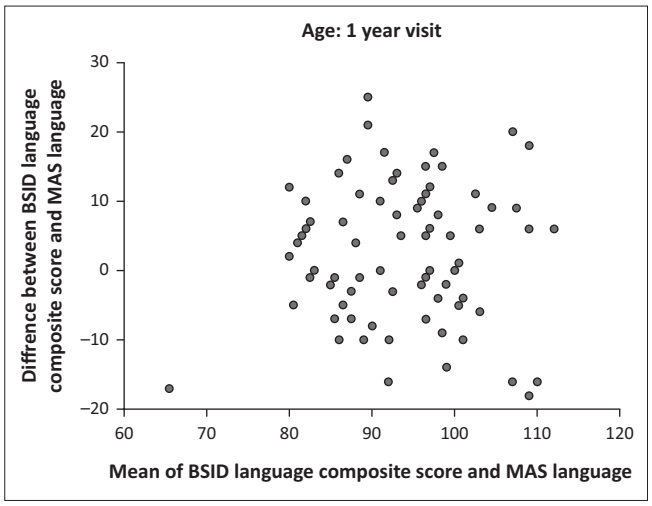
The linear relationships between individual domains of the MAS and BSID are shown in Table 3. In brief, correlations between MAS and BSID scores on similar domains were moderate or high, except for the fine motor domain, where BSID scaled score and MAS subquotients showed weak correlation at 11–14 months. In contrast, at 2–3 years, there was high correlation between MAS fine motor and BSID cognitive scores and between the MAS gross motor and BSID gross motor scaled score at the 1-year visit. Pearson showed correlation but not potential differences between the MAS and BSID scores, hence the secondary use of the Bland–Altman analysis. The mean difference between the MAS and BSID language, gross motor, and fine motor scores are presented in Figure 1, Figure 2, Figure 3, Figure

TABLE 3: Pearson correlation between Molteno Adapted Scales general and subquotient scores and Bayley Scale of Infant and Toddler Development-3rd edition composite and scaled scores.

Subquotient comparisons		Timepoint 1 (11–14 months)			Timepoint 2 (30–42 months)		
MAS	BSID	*r*	*p*	CI	*r*	*p*	CI
Gross motor	Gross motor-AS	0.75	< 0.001	[0.61, 0.90]	0.44†	< 0.001	[0.18, 0.69]
Fine motor	Fine motor-AS	0.23	0.030	[0.20, 0.44]	0.66	< 0.001	[0.45, 0.87]
Language	Language-cs	0.54	< 0.001	[0.30, 0.68]	0.58	< 0.001	[0.35, 0.81]
Fine motor	Cognitive-cs	0.48	< 0.001	[0.29, 0.64]	0.70	< 0.001	[0.45, 0.87]
Language	Cognitive-cs	0.46	< 0.001	[0.26, 0.62]	0.46	< 0.001	[0.21, 0.71]
GQ	Cognitive-cs	0.56	< 0.001	[0.35, 0.73]	0.62	< 0.001	[0.40, 0.84]
GQ	Language-cs	0.51	< 0.001	[0.35, 0.73]	0.56	< 0.001	[0.32, 0.79]
GQ	Motor-cs	0.53	< 0.001	[0.35, 0.72]	0.58	< 0.001	[0.35, 0.81]

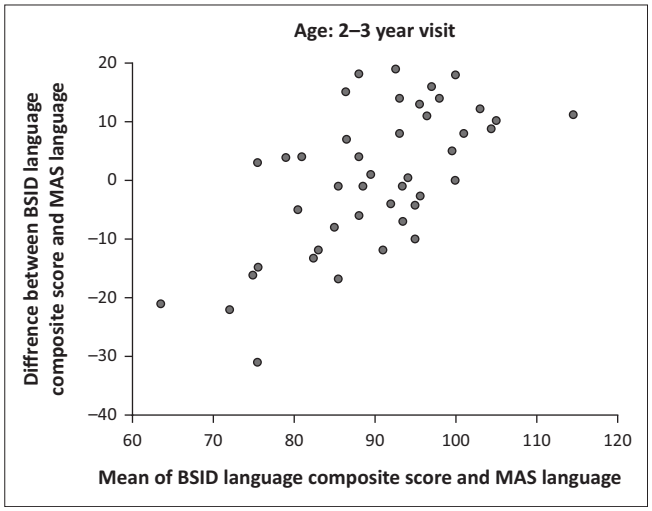
†, One value missing.

AS, Bayley sliding scales score; BSID, Bayley Scale of Infant and Toddler Development 3rd edition; CI, confidence interval; cs, composite score; GQ, general quotient; MAS, Molteno Adapted Scale; *r*, Pearson correlation coefficient.



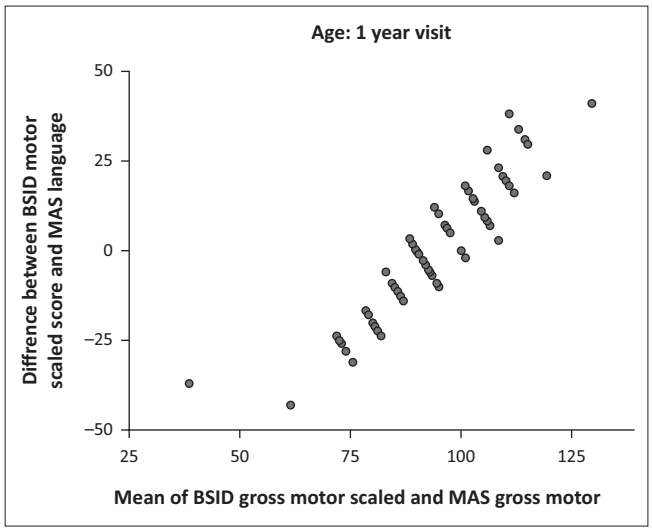
BSID, Bayley Scales of Infant and Toddler Development-third edition; MAS, Molteno Adapted Scale.

FIGURE 1: Bland–Altman scatter plot illustrating mean difference between Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition language scores versus Molteno Adapted Scales and Bayley Scales of Infant and Toddler Development-3rd edition language scores at the 1-year visit.



BSID, Bayley Scales of Infant and Toddler Development-third edition; MAS, Molteno Adapted Scale.

FIGURE 2: Bland–Altman scatter plot illustrating mean difference between Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition language scores versus Molteno Adapted Scales and Bayley Scales of Infant Development-3rd edition language scores at the 2–3-year visit.



BSID, Bayley Scales of Infant and Toddler Development-third edition; MAS, Molteno Adapted Scale.

FIGURE 3: Bland–Altman scatter plot illustrating mean difference between Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition gross motor scores versus Molteno Adapted Scales and Bayley Scales of Infant Development-3rd edition gross motor scores at the 1-year visit.

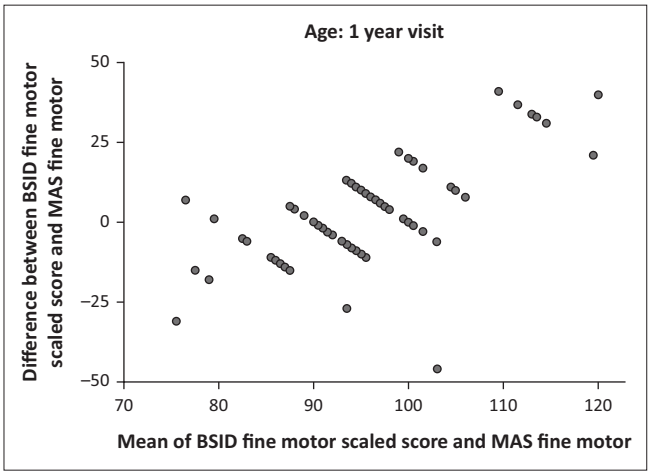
BSID, Bayley Scales of Infant and Toddler Development-third edition; MAS, Molteno Adapted Scale.

FIGURE 4: Bland–Altman scatter plot illustrating mean difference between Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition gross motor scores versus Molteno Adapted Scale and Bayley Scales of Infant Development-3rd edition gross motor scores at the 2–3-year visit.

4, Figure 5 and Figure 6. The MAS language scores were significantly lower than the BSID language scores at 1 year ($p = 0.029$), MAS gross motor scores were significantly higher than the BSID gross motor scores at 2–3 years ($p < 0.001$) and MAS fine motor scores were lower than fine motor scores on the BSID at 2–3 years ($p < 0.001$). However, at both timepoints, the mean differences between the MAS and BSID language, gross and fine motor scores were less than six in all domains.

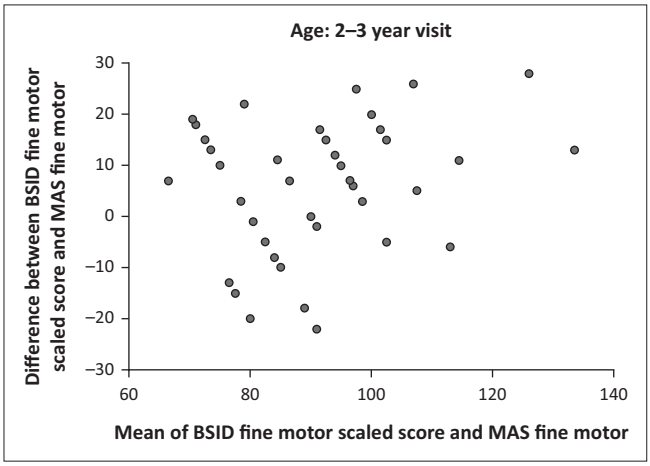
Correlation of the MAS and BSID language, gross and fine motor domains was predominantly moderate at both timepoints. However, the Bland–Altman graphs (Figure 1, Figure 2, Figure 3, Figure 4, Figure 5 and Figure 6) quantified agreement between the two scales and showed bias. The scatter plots illustrated the mean differences between MAS and BSID language, gross motor and fine motor scores throughout the performance range. The mean difference between MAS and BSID scores varied widely, evident especially in the fine and gross motor domains (Figure 3, Figure 4, Figure 5 and Figure 6) and in the language domain for the 2–3-year-olds (Figure 2). Discordance between scores on MAS and BSID increased in both upper and lower performance extremes which is of particular relevance for children with lower scores, that is MAS or BSID score < 85 (Figure 1, Figure 2, Figure 3, Figure 4, Figure 5 and Figure 6). Thus, individual children scoring in the range 'at risk' (< 85) for language development on the BSID may potentially have scored above this cut-off on the MAS.

There were no significant differences between the sexes regarding performance on the MAS. The trajectory for participants tested at both timepoints showed temporal stability for gross motor and language subquotient scores but fine motor and personal and social subquotients decreased with increasing age (Table 4).



BSID, Bayley Scales of Infant and Toddler Development-third edition; MAS, Molteno Adapted Scale.

FIGURE 5: Bland–Altman scatter plot illustrating mean difference between Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition fine motor scores versus Molteno Adapted Scales and Bayley Scales of Infant and Toddler Development-3rd edition fine motor scores at the 1-year visit.



BSID, Bayley Scales of Infant and Toddler Development-third edition; MAS, Molteno Adapted Scale.

FIGURE 6: Bland–Altman scatter plot illustrating mean difference between Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition fine motor scores versus Molteno Adapted Scale and Bayley Scales of Infant and Toddler Development-3rd edition fine motor scores at the 2–3-year visit.

Discussion

In this exploratory study, the authors aimed to determine concurrent validity for the MAS, a CDAT used by Western Cape health practitioners, by estimating correlation of similar domains, bias throughout the performance range and exploring temporal stability. The study found that the MAS and BSID gross motor subdomains at the 1-year visit (r = 0.75) and MAS fine motor and BSID cognitive domains at 2–3 years (r = 0.7) were the best fit. The high correlation between the MAS fine motor and cognitive domains could be because of the similarity of three items in both test batteries in this age range.

Despite generally moderate to strong correlations between developmental domains, discrepancy between the MAS and BSID scores increased at both the lower and upper extremes of the performance range. Accuracy in the lower range is vitally important when screening for delay; missing or over-identifying children at risk of developmental delay would limit the usefulness of the tool. Aylward (2009) previously cautioned against estimating developmental quotients, which use ratios of mental age to chronological age, as they may not be psychometrically valid and recommended use of norms and standard deviation cut-offs as an alternative. Currently, the MAS is used as an informal screening tool by health professionals and when combined with further diagnostic evaluation, developmental quotients should suffice. However, further validation involving children with global and specific developmental delays will determine whether using this alternative method strengthens its accuracy for research purposes.

The poor correlation between the MAS and BSID fine motor domains at the first timepoint was an unexpected finding. One possible explanation is the paucity of items in the MAS fine motor subscale at 1 year of age, unlike the BSID, which tests broader aspects of fine motor and visuo-perceptual ability and is more discriminatory. The MAS fine motor incorporates two items from the BSID cognitive scale but none from the fine motor scale in this age bracket and further addition of age-appropriate tasks to the MAS fine motor subscale may improve the correlation. Infants from this sociodemographic group may be unfamiliar with formboards, whereas inclusion of everyday items such as a cup and spoon would be fairer. Indeed, Faruk et al. (2020) in a systematic review of screening tools emphasised the need to revise and validate existing tools to make them more culturally sensitive.

TABLE 4: Comparison of Molteno Adapted Scale quotients at 11–14 months (timepoint 1) and 30–42 month (timepoint 2).

MAS quotients	Mean	*n*	Standard deviation	Standard error mean	*p*
Gross motor: timepoint 1	93.57	44	5.350	0.807	0.276
Gross motor: timepoint 2	95.18	44	8.689	1.310	
Fine motor: timepoint 1	93.70	44	5.294	0.798	0.010
Fine motor: timepoint 2	88.50	44	12.970	1.955	
Personal and social: timepoint 1	99.39	44	6.446	0.972	0.001
Personal and social: timepoint 2	93.52	44	9.720	1.465	
Language: timepoint 1	93.73	44	8.676	1.308	0.352
Language: timepoint 2	91.70	44	13.668	2.061	

The children's fine motor and personal and social subquotients were significantly lower at the second timepoint (Table 4). This decrease in developmental quotients with increasing age has been described previously in lower socioeconomic cohorts so may not necessarily reflect poor temporal stability of the tool (Laughton et al., 2010). Laughton, who tested a South African cohort of children from socioeconomically deprived conditions on the GMDS, found a decrease in quotient scores between 11 and 21 months of age, except for the gross motor domain. A previous study on construct validity of the Griffiths also postulated that the personal and social scale was the domain most susceptible to cultural bias (Luiz et al., 2001).

Selection of a reference measure (gold standard) to validate a CDAT needs careful consideration as Western assessment tools such as the BSID, may disadvantage African children. The apparatus and tasks may be unfamiliar (Kammerer et al., 2013) and research has found that some ethnic groups, for example, in Cameroun, may have a different developmental trajectory (Vierhaus et al., 2011). This has prompted creation of locally developed tools such as the Malawi Developmental Assessment tool (Gladstone et al., 2010) and the Kilifi Developmental inventory (Abubakar et al., 2016). These tools have not yet been validated in South Africa, which precluded their use as a reference measure for this study.

The BSID (3rd edition) has only recently been introduced as a reference measure in South Africa and differs in some respects from previous editions. Firstly, it was standardised on a North American population that included children with learning difficulties (Bayley, 2006). Secondly, the distinction between cognitive and language domains meant that the structure of the test differed from the Bayley Scales of Infant Development-2nd edition, which generated mental developmental and psychomotor developmental index scores. Concerns have been raised over the BSID under-identifying children with delay (Anderson & Burnett, 2017). The U.S. norms classify developmental delay as 'moderate' or 'at risk' (70–85) and 'severe' (< 70). Children tested on both second and third versions scored higher on the BSID (3rd edition) and led to some researchers questioning the current cut-off scores for 'at risk' and 'severe' developmental delay (Johnson et al., 2014). Although Rademeyer and Jacklin (2013) previously validated the BSID on black African infants in Gauteng, South Africa, their sample did not include children over 12 months of age.

Conclusion

To summarise, the authors found moderate to high correlation between comparable developmental domains of the MAS and BSID in this normative sample, which is reassuring because the BSID is a globally recognised tool. Weak correlation between the fine motor domains at 1 year of age will require further adjustment to this scale. The Bland–Altman analysis revealed bias suggesting that robustness of the tool is weaker in the extremes. The use of norms and standard deviations rather than developmental quotients could potentially mitigate this weakness.

Limitations of the study included firstly, the small sample size at the second timepoint, which may have limited the generalisability of findings. Secondly, the authors were unable to assess the diagnostic accuracy of the MAS versus the BSID to establish its validity as a screening tool for global developmental delay because of the small proportion of children with global developmental delay.

Therefore, the authors recommend further development of the MAS, including standardisation and validation across the age range and on children with varying degrees of delay, to determine norms as well as floor and ceiling effects. Future research should evaluate reliability, internal structure and consistency. Testing should be extended to all cultural groups and socioeconomic strata in South Africa before the tool can be used nationally.

Although the MAS remains a useful tool for detection of specific or global developmental delay in a paediatric outpatient clinic, standardised training of assessors in administration and scoring of the test is necessary. Compilation of a manual could include this information, specify dimensions for the apparatus, including formboards, pegman, building blocks and stairs as well as procedural instructions such as the number of permitted trials, and criteria for 'pass or fail'. The language evaluation also requires adaptation and standardisation to ensure it is culturally sensitive. Consultation with language practitioners with translation into all official South African languages would improve and broaden the applicability of the MAS to other provinces.

In conclusion, the authors would recommend further validation of the MAS on children aged 5 years and below, to include those with varying degrees of development delay, before endorsing it for wider clinical and research purposes. At this stage, use of the MAS is best restricted to medical or allied healthcare practitioners who regularly assess children with developmental problems.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

P.S. was responsible for conception, study design and execution of study, practical assessments of children, data acquisition, interpretation of results and writing of the first draft of article.

B.L. contributed to the study design and the interpretation of results. T.M.E. contributed to the conception of statistical methods and analysis. A.L.S. contributed to the conception of parent study and data acquisition. M.K. contributed to the study design and interpretation of data. All authors contributed to the reviewing of the article drafts.

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

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