Evaluating the PEDS:DM Developmental Screening Tool in Zulu and Northern Sotho

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Abstract

Screening of children's developmental milestones is imperative for early identification of developmental delays and early intervention. Translated developmental screening tools increase accessibility and in turn enable timely identification and intervention, which allows children to reach their potential. This quantitative study evaluated the translation accuracy of the Northern Sotho and Zulu Parents Evaluation Development Status: Developmental Milestones (PEDS:DM) in comparison with the English version of the tool. The study was conducted at a regional healthcare facility in South Africa. Stratified convenience sampling was utilised with a total of 546 caregivers representing children from 1 month to 6 years of age. The findings generally reflected a strong correspondence between the English and Northern Sotho, and the English and Zulu PEDS:DM tool, respectively. A few test items in the expressive language domain did not correspond significantly between languages. This could be due to cultural and social differences and should be investigated.

Keywords: early childhood development; Parents' Evaluation Development Status: Developmental Milestones; translations; accessibility; screening

1. Introduction

Child wellbeing is associated with several aspects of early childhood development, including physical, social, communication, emotional, and mental development (Richter et al. 2019). Investing in early childhood development is a cost-effective strategy to build human capital and promote sustainable development in many countries (Sayre et al. 2015). In contrast, childhood developmental delays and disorders impose a long-term financial burden on any country (Lunsky et al. 2018).

About 250 million children in low- and middle-income countries (LMICs) fail to reach their full developmental potential due to their exposure to a variety of environmental risk factors (Lancaster et al. 2018; Richter et al. 2019). Environmental risk factors encompass poverty, poor health and malnutrition, HIV-infection, stress, violence, abuse, neglect, and exploitation, as well as inadequate care and learning opportunities (Wickham et al. 2016). Global migration and demographic shifts due to urbanisation have also compounded issues relating to developmental delays in LMICs, as the children affected by the process often have limited or no resources (Vilaseca et al. 2019). The effects of environmental risks are mitigated by environmental protective factors such as community engagement, parent–child interaction, and parental knowledge (McDonald et al. 2016).

The early identification of developmental delays as a secondary preventative function can assist health providers to enhance protective factors, alleviate the effects of risk, and prevent or address developmental delays (Choo et al. 2019; McDonald et al. 2016). However, LMICs possess limited numbers of healthcare practitioners and other resources which can mitigate risk factors through provision of preventative care such as early developmental screening. These contextual limitations are further exacerbated by language constraints and lack of well-validated translated developmental screening tools (Maleka et al. 2016; Milner et al. 2019; Sincovich et al. 2019; Van der Merwe et al. 2017).

The Parents Evaluation Development Status: Developmental Milestones (PEDS:DM) is a quick and affordable screening tool which parents can use to identify children at risk of delayed developmental milestones, particularly in LMIC contexts (Van der Linde et al. 2016). In an event where illiterate caregivers and/or parents are not able to administer the tool themselves, the PEDS:DM may be administered in an interview format by a healthcare practitioner (Maleka et al. 2016). Since it is generally considered best practice that respondents should be provided with a questionnaire in the language in which they are most proficient, multiple validated language versions are a necessity in a country like South Africa with 11 official languages (Maleka et al. 2016; Pinto-Martin et al. 2005). In settings experiencing constrained infrastructural, human, and financial resources, a parent-administered developmental screening programme may help facilitate entry to early intervention services for the identification, management, and prioritisation of referrals (Lynn, Newton, and Rae-Grant 2012). Yet these

developmental screening services are typically unavailable in contexts where children are at risk of developmental delays (Maleka et al. 2016).

A variety of parent-administered developmental screening tools are available, the reliability and validity of which have been reported on in studies in high-income countries (Boggs et al. 2019; Glascoe, Woods, and Robertshaw 2016; Hsiao et al. 2016). In LMICs, however, developmental screening is characterised by fragmented and uncoordinated services (Black et al. 2017) and very little opportunity for evidence-based practice. Accordingly, further investigation is required on the topic of contextually relevant developmental screening in LMICs (Boggs et al. 2019). In South Africa, the validated Ages and Stages Questionnaire (ASQ) and the PEDS tools (i.e., the combined PEDS and PEDS:DM) have been proposed as appropriate developmental screening tools based on parental report for use in primary healthcare settings (Richter et al. 2019). The PEDS elicits parents' concerns about children's developmental milestones and the PEDS:DM is indicative of children's skills across all developmental domains (Glascoe, Woods, and Robertshaw 2016). Although both the ASQ and the PEDS tools have been validated, other aspects such as cost, time, and expertise required to administer the test are important considerations when selecting a screening tool for primary care settings. The PEDS tools are preferred due to their rapid screening potential at a minimal cost (Mbuyi 2015; Maleka et al. 2016). If the validated PEDS tools have been selected for use in LMICs, the need for translated versions of these tools in local languages becomes obvious (Gladstone et al. 2010). Improving access to developmental screening services through the translation of validated developmental screening tools and the use of smartphone applications should be a primary focus for researchers and practitioners in early childhood development (Maleka et al. 2016).

The validated PEDS test has been translated into 39 languages worldwide, but the PEDS:DM has only been translated into 6 languages (Glascoe, Woods, and Robertshaw 2016). There is less cost involved in translating existing tools for use in LMICs than in developing new tools, and the translated tools are more likely to maintain construct validity for reliable use (Abessa et al. 2016; Dowling and Whitelaw 2018). The translation of the PEDS:DM into more languages is a priority, since it will allow improved access to developmental screening services tailored to support caregivers in their home languages (Fyvie et al. 2016; Glascoe 2013).

Zulu and Northern Sotho are prominent South African home languages among South Africa's 11 official languages, collectively representing a third of South African households at 23% and 10%, respectively (Stats SA 2016). Therefore, translating a contextually relevant developmental screening tool into these two languages could have a far-reaching impact on service delivery. In 2019, the PEDS was translated into Northern Sotho and Zulu in order to broaden access to developmental screening services to the majority of the population in their respective home languages (Fyvie et al. 2016; Van der Merwe et al. 2017). A high correspondence was reported between positive responses as well as between negative responses, which is indicative of a perfect

association in translations of the PEDS from English to Northern Sotho, as well as from English to Zulu (Fyvie et al. 2016, Van der Merwe et al. 2017). It was evident that the PEDS test remained accurate irrespective of the language in which the test was conducted. The PEDS and PEDS:DM are recommended for combined use as both parental concerns and developmental milestones are considered, consistent with the American Academy of Paediatrics (AAP) policy statement regarding systematic developmental screening (Green et al. 2019). It seems relevant, therefore, to also investigate the translation of the PEDS:DM.

The translation of the PEDS:DM into both Northern Sotho and Zulu has the potential to increase access to developmental screening services and ultimately the identification of developmental delays, as well as intervention for some of the most vulnerable populations (Van der Merwe et al. 2017), but the accuracy of the translations is of crucial importance. Forward–backward translation is a widely used translation method for translating test instruments (Kalfoss 2019; Wild et al. 2005). An accurately translated developmental screening tool should have a strong association with the tool in the original language (Glascoe 2013). This study evaluated the translation accuracy of the Northern Sotho and Zulu PEDS:DM by comparing it to the English version of the tool.

Ethical clearance was obtained from the Research and Ethics Committee of the Faculty of Health Sciences, University of Pretoria (HUM023/0119) and permission to conduct the study at the selected research site was then formally sought and obtained from both the Department of Health and the site's clinical manager. Subsequently, respondents issued their written and verbal informed consent to participate in the study, which had minimal risk exposure.

2. Methodology

A quantitative cross-sectional subject-based (learning focus area) research design was adopted to determine the accuracy of the Northern Sotho and Zulu PEDS:DM by comparing their outcomes to those of the English PEDS:DM.

2.1 Setting and Participants

Participants were selected from a government regional secondary healthcare facility located in Eastern Johannesburg. The region is characterised by high inter-nodal traffic volumes providing transport and other services to residents in surrounding and outlying areas (Stats SA 2016). The hospital itself receives self-referrals and referrals from neighbouring primary healthcare clinics. The neighbouring Black African township has a population density of 25 979 persons/km^2, only 6% of whom have a higher education qualification (Stats SA 2016). In contrast, the neighbouring predominantly White suburb has a population density of 2 461 persons/km^2, 40% of whom have tertiary

education. There are currently no formal developmental screening services in either the White suburb or the Black African township (Stats SA 2016).

Stratified convenience sampling was used for the selection of 546 research participants whose demographic characteristics are reflected in Table 1.

Table 1: Distribution of participants according to demographics

Variable	Category	Group 1 (G1) English/Northern Sotho Group	Group 2 (G2) English/Zulu Group
		Number (%)	Number (%)
Population Group*	Black	313 (100.0)	229 (98.0)
	Coloured	0 (0.0)	4 (2.0)
Child's Gender	Male	135 (43.1)	105 (45.1)
	Female	178 (56.9)	128 (54.9)
Relationship with Child	Mother	268 (85.6)	172 (70.4)
	Father	31 (9.9)	31 (13.3)
	Family member	11 (3.5)	29 (12.4)
	Non-family caregiver	3 (1.0)	1 (3.9)

* Population group descriptions as outlined in the national census classification (Stats SA 2016)

For comparative purposes, the participants were divided into two groups. Group 1 consisted of 313 Northern Sotho parents/caregivers and Group 2 of 233 Zulu parents/caregivers. Both groups were further subcategorised according to the PEDS:DM age group to which their offspring/charges belonged, which yielded about 10 participants per age category. The first group comprised predominantly Northern Sotho caregivers who were also proficient in English. The English and Northern Sotho PEDS:DM was administered to this group. The second group comprised mainly Zulu caregivers who were also proficient in English. The English and Zulu PEDS:DM was administered to this group. The majority of the participants (100%, n = 313 for the English/Northern Sotho group and 98%, n =229 for the English/Zulu group) were from the Black African population group.

2.2 Data Collection Material

The English paper-based PEDS:DM constituted the primary data collection method. The PEDS:DM's developmental domains are premised on expressive (speech) and receptive (listening) language, fine and gross motor skills, as well as social, emotional, self-help, and academic skills (Glascoe, Woods, and Robertshaw 2016). Typically, the PEDS:DM consists of six to eight questions, such as "Can your child walk without falling?" or "Is your baby able to drink (not suck) from a cup?" In terms of the

PEDS:DM, if there was an indication in one or more of the developmental domains that a referral was required for further screening or testing (commonly termed a "refer"), then the overall result would constitute a "refer" (Glascoe, Woods, and Robertshaw 2016).

The newly translated paper-based Northern Sotho PEDS:DM and Zulu PEDS:DM were also used to collect data. In addition, a language-preference questionnaire was administered to determine the participants' preferred language.

2.3 Data Collection Procedures

The study was conducted in two phases. The first phase entailed the translation of the English PEDS:DM into Northern Sotho and Zulu, respectively, while the second phase entailed validating the translations of the PEDS:DM. The translations were conducted by two Northern Sotho and two Zulu linguists from the University of Pretoria's African Languages Department. The linguists were translators registered with the Pan South African Language Board (PANSALB) with five years' working experience. Forward translation of the PEDS:DM took place, whereby the English version was provided to one Northern Sotho and one Zulu registered translator to translate into Northern Sotho and Zulu respectively; thereafter the newly translated versions were given to the other Northern Sotho and Zulu registered translators who translated the Northern Sotho and the Zulu PEDS:DM back into English (back translation); finally, the English translations were compared to the original English version. Subsequent to their conclusion of the translation process, the language practitioners consulted with a speech therapist (proficient in indigenous languages) and two other professional linguists to review both the translation process and the accuracy of the translated versions. The translations were produced in accordance with the World Health Organization (WHO) translation protocols as well as the principles of good practice for the translation and cultural adaptation process of instruments (WHO 2016). Phase 2 entailed the evaluation of the translated Northern Sotho and Zulu PEDS:DM according to the outcomes of the English PEDS:DM.

The data collection process itself commenced with the researcher (Boledi Maleka)'s involvement of caregivers at a regional healthcare facility between June 2019 and February 2020. Once informed consent forms had been obtained, demographic questions were asked, followed by the administration of the English, Northern Sotho, or Zulu PEDS:DM, depending on the parent/caregiver's preferred language. The researcher randomised the English PEDS:DM and the Northern Sotho or Zulu PEDS:DM to compensate for a learning effect. The final phase involved the completion of a language-preference questionnaire by the parents/caregivers. Based on the outcomes of the English PEDS:DM, referral letters were provided to parents/caregivers whose children failed the screening. These letters were for the attention of relevant healthcare professionals, so that appropriate steps could be taken to address the children's problems (Oliver et al. 2002).

2.4 Data Analysis

Descriptive statistics were used to analyse the participants' biographical information. Pearson's chi-squared test, Fisher's exact test, and the post-hoc tests (i.e. the phi coefficient and Cramer's V test) were applied to determine whether any statistically significant association existed between the categorical variables of the English PEDS:DM and the newly translated Northern Sotho and Zulu PEDS:DM (Akoglu 2018). The chi-squared test is used to determine whether there is a statistically significant association between two categorical variables in the event that one (or both) of the variables has two or more categories (Faul et al. 2009). For small samples with sparse data in the cells, Fisher's exact test is used. Accordingly, if the *p*-value is less than 0.05, there is a statistically significant association and ad hoc tests are run in order to determine the strength of the association. The phi coefficient (used where both variables have two categories), and Cramer's V (used where at least one variable has three or more categories) range from 0 to 1; the closer the value is to 1, the stronger the association.

In both the Northern Sotho and Zulu PEDS:DM, the degree and strength of the association of the categorical variables (shown in the supplementary tables in the appendix) were determined in accordance with the categories of association (Akoglu 2018).

3. Results

The English version of the PEDS:DM and the newly translated Northern Sotho and Zulu PEDS:DM showed an association in outcomes across all age groups and all the test items (Table 2). The majority (98/125) of the test items showed perfect association across the English and Northern Sotho data. Furthermore, 102/125 test items across the English and Zulu data showed a perfect association. In 19/125 instances, there was perfect association with warnings of sparse data across the English and Northern Sotho data and 10/125 such instances between the English and Zulu data. Additionally, 4/125 test items revealed very strong association data across the English and Northern Sotho data and 1 such instance between English and Zulu data. One instance of a statistically not significant association between both English and Northern Sotho and English and Zulu was found (see Table 3 and the second supplementary table in the appendix). The perfect associations are indicative that the English PEDS:DM was adequately translated into both Northern Sotho and Zulu.

Table 2: Fail rate per PEDS:DM across age group categories (0 months–7 years 11 months) for translated Northern Sotho and Zulu versions

	Group 1 (G1): *Northern Sotho/English	**Group 2 (G2): *Zulu/English**
****Age Category**	**Frequency (*n*); Percentage (%)**	**Frequency (n); Percentage (%)**
0–2 months	6/27 (22.2)	6/10 (60.0)
3–4 months	0/20 (0.0)	6/10 (60.0)
5–7 months	2/17 (11.8)	6/16 (37.5)
8–10 months	10/10 (100.0)	12/16 (75.0)
11–13 months	5/10 (50.0)	5/13 (38.5)
14–16 months	6/10 (60.0)	2/12 (16.7)
17–19 months	13/13 (100.0)	13/13 (100.0)
20–22 months	3/16 (18.8)	5/12 (41.7)
23–25 months	4/17 (23.5)	11/11 (100.0)
2 y 2 m–2 y 4 m	18/18 (100.0)	10/10 (100.0)
2 y 5 m–2 y 9 m	7/16 (43.8)	8/15 (53.3)
2 y 10 m–3 y 2 m	17/17 (100.0)	8/11 (72.7)
3 y 3 m–3 y 7 m	20/20 (100.0)	10/10 (100.0)
3 y 8 m–4 y 0 m	1/18 (5.6)	4/12 (33.3)
4 y 1 m–4 y 10 m	13/14 (92.9)	10/10 (100.0)
4 y 6 m–4 y 10 m	2/15 (13.3)	10/10 (100.0)
4 y 11 m–5 y 5 m	0/12 (0.0)	5/11 (45.5)
5 y 6 m–6 y 0 m	11/11 (100.0)	4/10 (40.0)
6 y 1 m–6 y 11 m	0/17 (0.0)	8/11 (72.7)
7 y 0 m–7 y 11 m	1/15 (6.7)	0/10 (0.0)
Total	**122/313 (39.0)**	**143/233 (61.4)**

* There was a 100% correlation in outcomes across all age groups between the English and newly translated Northern Sotho and Zulu PEDS:DM
**Twenty age categories as per PEDS:DM forms

In most of the test items, there was a perfect association between the English and Northern Sotho PEDS:DM and between the English and Zulu PEDS:DM, which indicates a high level and strength of agreement between these language groups (due to the high phi coefficients and Cramer's V values) (see the supplementary tables in the appendix). In the Northern Sotho and English group, a very strong association was found in the 0–2 months, fine motor category, and in the 2 years 5 months–2 years 9 months adaptive behaviour and receptive language categories (see supplementary tables in the appendix). Furthermore, in the Zulu group a very strong association was found in the 7 years 0 months–7 years 11 months expressive language category. However, there were two items in the Zulu group where there was no significant association. This was in 1 age category out of 20 (5.0%). The only test items (14–16 months in the Northern Sotho group and 2 years 10 months–3 years 2 months in the

Zulu group) that were not significantly associated in both Northern Sotho and Zulu are from the same developmental domain, namely expressive language.

The indigenous language was the preferred language of testing in the English and Northern Sotho group with the majority of participants (n = 265; 84.7%) indicating that they preferred Northern Sotho as a language of testing. In the Zulu group 175 (75.1%) participants preferred Zulu as a testing language to English.

Table 3: Items with no significant association between the translated English and Northern Sotho and Zulu PEDS:DM

Age Group	*n*	Testing Language	Developmental Domain	Test Question	Test statistic	Fisher's exact *p*-value	Phi/ Cramer's V
Age group 6: Form F, 14-16 months	10	Northern Sotho	Expressive Language	"If you offer your child something she likes, does she nod or say 'yes'?"	14.375	0.067	0.848
Age group 12: Form M, 2 years 10 months–3 years 2 months	11	Zulu	Expressive Language	"When your child talks to other people, how much do they understand of what he or she says?"	6.519	0.055	0.770

4. Discussion

The test items without a significant association between the English and Northern Sotho and English and Zulu groups were both in the expressive language domain (Questions in Table 3). This could be due to the limited social and cultural relevance of questions in this age group category (expressive language developmental milestone) (see Table 3; Byrd 2016). In South Africa, an authoritative parenting style is not uncommon. With reference to the test question "If you offer your child something she likes, does she nod or say 'yes'?" (see Table 3), it may therefore be that when a child is handed something, the expectation is that the child will simply take it (Roman 2014). The test items in the PEDS:DM listed in Table 3 may not be relevant in some cultures and it is therefore recommended that future research should investigate the PEDS:DM to ensure the cultural and social applicability of the tool in South Africa. A previous study also recommended investigation to ensure that the tool is viable to use in different contexts (Kiing et al. 2011).

The referral rate was exactly the same for the English and Northern Sotho group and for the English and Zulu group. A higher referral rate was found in the English and Zulu group than in the English and Northern Sotho group (Table 2). Table 2 shows the fail rates across all age group categories for the Northern Sotho (122/313, 39%) and Zulu (143/233, 61.4%) groups, respectively. There were six age groups with a 100% fail rate in both the Northern Sotho and the Zulu language groups. In the two age groups of 2 year 2 months–2 year 4 months and 3 year 3 months–3 year 7 months, a 100% referral

rate was seen in both the English and Northern Sotho group as well as in the English and Zulu group (Table 2). As mentioned above, this could be due to the test items in these categories not being contextually and culturally relevant (Fischer, Morris, and Martines 2014).

Future research should evaluate the contextual and cultural relevance of the PEDS:DM in South Africa. Further investigations regarding reasons for language preference would contribute to the improvement of translations into other indigenous languages from the English PEDS:DM.

5. Conclusion

The newly translated Northern Sotho and Zulu versions of the PEDS:DM are accurate developmental screening tools when compared to the original English version. A strong association was found between the English PEDS:DM and the Northern Sotho and Zulu PEDS:DM. Further investigation of the cultural and contextual relevance of the PEDS:DM in South Africa is recommended. Developmental screening in African indigenous languages will assist in the early detection of developmental delays in low-income settings and enable early access to surveillance and intervention services.

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