

Clinical usefulness of Korean Developmental Screening Test for Infants and Children (K-DST)

Jun Min Cha^{1*}, Jang Woo Lee¹, Seong Woo Kim^{1†}, Da Wa Jung¹, Chul Hoon Jang², Ji Yong Kim³, Joongmo Kang³

National Health Insurance Service Ilsan Hospital, Department of Physical Medicine and Rehabilitation¹, Gangnam Severance Hospital, Yonsei University College of Medicine, Department of Rehabilitation Medicine², Inje University Ilsan Paik Hospital, Department of Physical Medicine and Rehabilitation³

Objective

Developmental disability is a decline in physical, mental, cognitive, and verbal abilities during development. Unlike adults, because infants and children should go through developmental milestones, earlier detection of developmental disabilities is critical for timely interventions. The Korean-Ages and Stages Questionnaire (K-ASQ) and the Denver Developmental Screening Test II (DDST-II) have been used as tools for developmental screening. However, there are limitations in both methods. Korean Developmental Screening Test for Infants and Children (K-DST) was developed for Korean infants and children from 2011 to 2014 through a study of related departments such as Korean Society of Pediatric Rehabilitation and Developmental Medicine and Korean Pediatric Adolescent Psychiatric Association. It is said to be more suitable for the cultural BACKGROUND of Korea and reliability and validity are already verified. The aim of this study is to investigate whether K-DST is suitable as a screening tool for developmental disorders by comparing K-ASQ and K-DST, which are the same caregiver report types.

Method

This study was performed in patients between 4 months and 71 months from April 2010 to November 2013. All caregivers of the patients were asked to carry out both K-DST and K-ASQ questionnaires and if necessary, K-BSID II and K-WPPSI were used as reference scale. The final diagnosis was made by three experienced specialists (physiatrist, pediatric psychiatrist and pediatric neurologist) at the developmental delay clinic. The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of each K-DST and K-ASQ were calculated based on the final clinical diagnosis. In addition, we analyzed how well the two screening tests reflect the results of the K-BSID II or K-WPPSI test.

Results

A total of 145 infants and children were included in this study. The mean age was 39.1 (\pm 16.4) months, of which 100 were boys. 123 children were finally diagnosed clinically as developmental disability, 40 with autistic spectrum disorder (ASD), 46 with mental retardation (MR)/global delayed disorder (GDD), and 37 with developmental language disorder (DLD). The K-BSID or K-WPPSI were assessed in 93 children, 55 and 38, respectively. There was no statistically significant difference in sensitivity, specificity, PPV,

NPV, and accuracy between K-ASQ and K-DST (Table 1). The correlation between K-DST/K-ASQ average and K-BSID-II and K-WPPSI is shown in Table 2. Overall, there is no statistically significant difference between K-DST and K-ASQ.

Conclusion

K-DST is a fairly good screening tool for developmental delay which is suitable for the cultural BACKGROUND of Korea and is expected to replace K-ASQ with high validity.

Table 1. Sensitivity, specificity and accuracy of K-DST and K-ASQ

	K-ASQ		K-DST		p-value
	Fail	Pass	Fail	Pass	
Disease group (n=123)	103	20	102	21	
Normal group (n=22)	5	17	2	20	
Sensitivity(%)	83.7 (77.2-90.3)		82.9 (76.3-89.6)		0.7629
Specificity(%)	77.3 (59.8-94.8)		90.9 (78.9-100.0)		0.1615
PPV(%)	95.4 (91.4-99.3)		98.1 (95.4-100.0)		0.1804
NPV(%)	45.9 (29.9-62.0)		48.8 (33.5-64.1)		0.5734
Accuracy	82.8 (76.6-88.9)		84.1 (78.2-90.1)		0.6168

K-DST : Korean Developmental Screening Test for Infants and Children, K-ASQ : Korean-Ages and Stages Questionnaire, PPV : positive predictive value, NPV : negative predictive value

Table 2. Correlation analysis between K-DST/K-ASQ average and K-BSID-II, K-WPPSI (Pearson correlation)

	K-BSID-II (n=55)				K-WPPSI (n=38)					
	MDI (p value)		PDI (p value)		TIQ (p value)		VIQ (p value)		PIQ (p value)	
	r	P	r	P	r	P	r	P	r	P
K-DST_average	0.576‡		0.515‡		0.5879†		0.5665†		0.5959‡	
		0.8344		0.9662		0.7441		0.8687		0.7788
K-ASQ_average	0.617‡		0.575‡		0.4586*		0.4703*		0.4749*	

K-DST : Korean Developmental Screening Test for Infants and Children, K-ASQ : Korean-Ages and Stages Questionnaire, K-BSID-II : Bayley Scales of Infant Development-II, K-WPPSI : Korean-Wechsler Preschool and Primary Scale of Intelligence, MDI : mental development index, PDI : psychomotor development index, TIQ : total intelligence quotient, VIQ : verbal intelligence quotient, PIQ : performance intelligence quotient

*: correlation p-value < 0.05

†: correlation p-value < 0.001

‡: correlation p-value < 0.0001