King Devick Test VS. Developmental Eye Movement Test

Basiliki Evelyn Tomaras
and
Sarah Trommater
Senior Project
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King Devick Test VS. Develomental Eye Movement Test (DEM)

Abstract:

Two tests of eye movement skill that require calling out rows of numbers are currently in use in optometric practice. Our project is comparing the King Devick test validity in diagnosing oculomotor dysfunction to the Developmental Eye Movement Test (DEM) test. The participants for the project consisted of thirty-two seventh and eighth graders at Morey Charter School in Winn, Michigan. Consent forms were sent out one week prior to the start of the data collection. The investigator administered each test randomly to each student during the study hall hour for ten to fifteen minutes. The King Devick test includes a demonstration card and three test cards with eight rows of five numbers read horizontally simulating saccades that occur when reading. The King Devick test is a diagnostic tool that assesses poor saccadic ability. However, it does not take into consideration that some individuals are slow in naming digits. In comparison, the DEM test consists of a vertical array of numbers and a horizontal array of numbers and can diagnose oculomotor dysfunction and visual-verbal automatic skills by the amount of time each student takes to

complete each task. We will be using McNemar's test to statistically analyze the results.

King Devick Test VS. DEM Test

Introduction:

Optometrists today are currently using two tests of eye movement skills that require calling out rows of numbers and based on the results recommending vision therapy in optometric practice. These two tests are the King Devick Test (KD) and the Developmental Eye Movement Test (DEM). Our project is comparing the King Devick Test (KD) validity in diagnosing oculomotor dysfunction to the Developmental Eye Movement Test (DEM). The King Devick test includes a demonstration card and three test cards with eight rows of five numbers read horizontally simulating saccades that occur when reading (1). The King Devick test is a diagnostic tool that assesses poor saccadic ability (1). However, it does not take into consideration that some individuals are slow in naming digits (1). In comparison, the DEM test has a specific method to factor out the consequences of automaticity on oculomotor performance (2). The DEM test consists of a vertical array of numbers and a horizontal array of numbers and can diagnose oculomotor dysfunction and visual-verbal automatic skills by the amount of time each student takes to complete each task (1). Optometrists normally use either one or the other. Not knowing if these tests are equivalent makes it very hard for communication within our discipline. In order to make intelligent decisions as a profession, we need to know if vision therapy is recommended by both tests for a certain child most of the time or if there is no relationship between outcomes of the two tests. Our hypothesis is that there is no statistically significant diagnostic difference between

the results of the King Devick Test (KD) and those of the Developmental Eye Movement Test (DEM) for a given student. The results were statistically analyzed by McNemar's test.

Methods:

The research proposal was approved by the human subjects committee at Ferris State University. The subjects were thirty-two seventh and eighth grade students at the Morey Charter School in Winn, Michigan. The gender balance was nearly equal of 55% females and 45% males. No student was required to participate. There was no reward for participation and the student was not diagnosed as a result of participating. No student names appeared on the recording form. The students' science teacher administered the two tests. Each student was taken from class to a quiet room for approximately 10 minutes. The student was then given each of the two tests successively in random order. The order was determined by a coin toss. Each tests stated that the test booklet should be laid out in front of the child. There was no working distance specified. The student was allowed to sit as close as desired to the test booklet and this distance was recorded. If the student wore glasses or contacts for reading, they were tested wearing them. The student was told not to touch either test booklet. Each test began with a pre-test to ensure that the student understood the process. The DEM consists of a pre-test and three sub-tests. The first two sub-tests consist of vertical columns of numbers that the student read out loud to the administrator. The third sub-test consists of horizontal rows of numbers that were also read out loud. In each case the student was instructed to read the numbers as quickly and accurately as possible. The student was timed for each

portion of the test. The time for each sub-test was recorded along with the number and type of errors made. The student's performance was then compared with normative data. The normative data was listed according to age and grade level. The KD Test consists of a demonstration card and three sub-tests. The first sub-test consists of rows of numbers with lines connecting the numbers in each row. The second and third sub-tests consist of rows of numbers with no connecting lines. For each sub-test, the student calls out the numbers as quickly and accurately as possible. The administrator times each sub-test and records the results. The number and type of errors is also noted. The results are compared to those of the normative sample. The normative data is listed according to age group.

Any student with results that are greater than one standard deviation slower than the average for his or her grade level would be flagged. The number of students flagged for each test would be compared for consistency between the two tests. Results will be analyzed using McNemar's test.

Results:

The results are a probability in terms of the p-value. When the p-value is less than 0.05 it shows that there was a significant relationship between the two sets of data. However, when the p-value is more than 0.05 there is no significant relationship between the two sets of data. Data 1 showed the t statistic for the two sets of z scores is .455 with 31 degrees of freedom, which gives a probability of .652. As a result the King Devick Test and the DEM do not statistically have significant diagnostic difference between the results.

Data 1 consists of a 2x2 table indicating Vision Therapy (VT) recommendations from the results of the King Devick Test and the DEM. The guidelines used to decide whether vision therapy was recommended is by less than 85 standard score on DEM and a z score of DEM ratio greater than 1. The chi square number using McNemar's test is .3, giving a probability of 0.5839. This again shows there is no significant relationship between the two tests with respect to recommendations for oculomotor vision therapy.

The table indicates that two subjects failed the King Devick Test and the DEM test thus needing vision therapy. Twenty of the subjects passed both the King Devick Test and the DEM, which vision therapy was not recommended. Six subjects require vision therapy when failed the King Devick Test, but passed the DEM test. Thus these six subjects who failed the King Devick test, but passed the DEM had vertical times that were low which makes them slow processors but they had good ratios. Four subjects required vision therapy after failing the DEM test, but did not require vision therapy under the King Devick Test. Thus these four subjects who failed the DEM, but passed the King Devick Test were fast at processing but their ratios were poor.

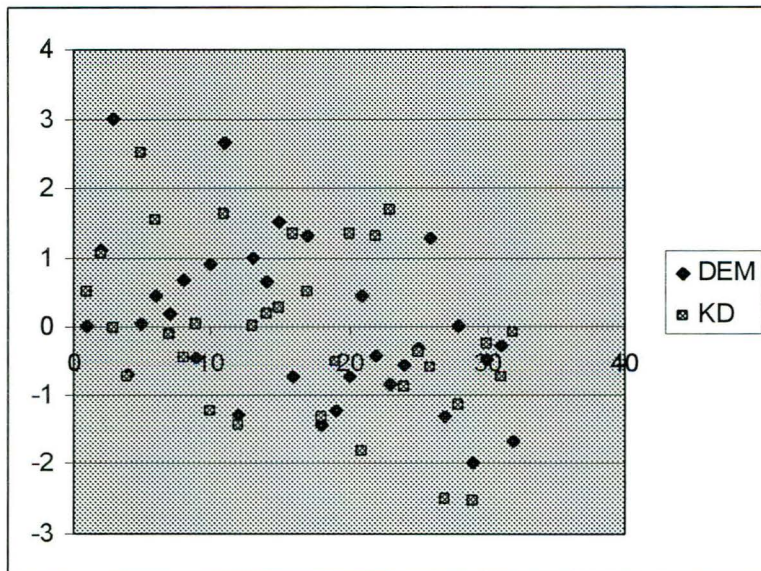Data 2 shows KD and DEM plotted on z-score. This is a very significant plot. Indicates random and unpatterned results between the relationships of the two sets of z scores. The plot truly indicates no meaningful relationship.

Data 1

T-TEST	VT			
0.652137	recommendations:	KD		
			VT rec.	No VT
	DEM	VT rec.	2	4
		No VT	6	20

Data 2

Discussion

Optometrists are using the King Devick Test and the DEM Test in recommending vision therapy based on the results. The King Devick Test was made as a diagnostic tool to assess poor saccadic ability that contributes to poor reading ability (1). However, it does not take into consideration that some individuals are basically slow in naming digits, which does not correlate with saccadic eye movements (1). The DEM has further refined the assessment of saccadic eye movements by using vertical array of numbers to test the subjects' visual – verbal automaticity (1). After collection of the data, guidelines were created for recommendation to subjects that needed vision therapy for oculomotor

dysfunction. The results were analyzed by McNemar's test giving the t statistic and the scatter plot to indicate that there was no statistically significant relationships between the two sets of z scores from the King Devick Test and the DEM. Thus, the paired t-test results are dissimilar.

Vision therapy is important to optometry and it expands our scope of practice. It is important for optometrist to have an understanding of the difference between these two tests and can make an informed decision on vision therapy for each individual patient. It is possible that one patient could be told that vision therapy is needed by one provider and not needed by a second provider. This may be causing misinterpretation of data in our field. Thus, could cause the patient to be confused or to lose faith in optometrists that do vision therapy. This is an area of optometry that many people do not understand. An awareness of these two tests and how they relate to one another will help add credibility to this kind of testing.

References:

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