Raw or Adjusted? A problem in vertical time in DEM test

Maria Vittoria Manzoli1, Alessio Facchin2,3, Milena Ruffino4, Andrea Faccetti4,5, Silvio Maffioletti6
1 Optometry private practice, Ostiglia, MN, Italy; 2 Department of psychology, University of Milano Bicocca, Italy; 3 Department of psychology, University of Parma, Italy; 4 Developmental Neuropsychology unit, IRCCS “E.Medea”, Bosisio Parini, LC, Italy; 5 Department of psychology, University of Padova, Italy; 6 Degree course in Optics and Optometry, University of Padova, Italy.

Introduction

Developmental Eye Movement (DEM) test is a clinical and screening test used to measure, in terms of accuracy and time, ocular motility and naming skills in developmental age. The test is used to determine saccadic eye movements efficacy analyzing the speed and the accuracy with which a series of 80 single digit numbers can be located, recognized and verbalized rapidly. The DEM consists of one pre-test and two section: a vertical one (test A and B) in which the subject has to read aloud 80 numbers arranged in four evenly-spaced columns and a horizontal one (test C) in which the 80 numbers are written unevenly spaced in 20 rows. The examiner must record the times required to complete the vertical and the horizontal tests and errors. Subject’s performance is analyzed by ratio that is calculated dividing the horizontal time by the vertical time.

Hypothesis

Although procedures to administer DEM test are widely applied and predict the use of Unadjusted Vertical Time (UVT; uncorrected for errors), the scoresheet published in manual reports the Adjusted Vertical Time (AVT; corrected for errors). With this study we want to compare AVT (Adjusted Vertical Time) with UVT (Unadjusted Vertical Time) scores to check if the value obtained by correction are significantly different or not. We want also to check if the difference between AVT and UVT could modify the calculation of ratio and in consequence the test’s result.

Subjects

We administered the DEM Test to 288 children aging from 6 to 12 years, 145 male and 133 female, during a school screening program. All subjects arise from several school screening programs and were required to have parental authorization to participate in the study. All subjects had to present some criteria for inclusion: they had to wear their optical correction if necessary, they had to have a binocular visual acuity at near equal or better than 0.8 decimal acuity.

Methods and procedures

DEM test was administered using the standard procedure described in the user’s manual. The test was performed individually in a quiet room without distractions, comfortably seated at a desk. Every children has performed in a fixed sequence: the pre-test, the test A and B (that represent the “vertical” part of the test) and the test C (the “horizontal” one). The examiner had to measure with a chronograph and to note precisely the time of every part of the test (A+B and C) and all errors distinguishing: substitution errors (s), omission errors (o), addition errors (a) and transposition errors (t).

At the end of examination were calculated:
1. The Adjusted Horizontal Time,
2. The Unadjusted Horizontal Time
3. The Adjusted Vertical Time
4. The ratio using UVT
5. The ratio using AVT.

Results

To assess the difference between errors a single factor ANOVA with 4 levels (kind of error) was performed for errors in vertical condition. The same analysis was performed for horizontal condition. In vertical test the most common error was the substitution (F(274)=41.9 p<0.0001) and in horizontal test the most common error was the omission (F(274)=57.59 p<0.0001). Globally there are more errors in horizontal direction than in vertical direction (F(274)=9.06 p<0.0001).

A MANOVA with one factor between (age, with 9 levels) and one factor within (adjusted, with two levels) was performed to assess difference between UVT and AVT. Results show that AVT was faster than UVT (F(1,274)= 49.72 p<0.0001). The interaction was significant (F(9,274)=3.85 p<0.0005).

Similarly a MANOVA with one factor between (age, with 9 levels) and one factor within (adjusted, with two levels) was performed to assess difference between ratio from UVT and ratio from AVT. Results show that ratio from AVT was higher than Ratio from UVT (F(9,274)=63.74 p<0.0001). The interaction Age x adjusted was also significant (F(9,274)= 9.91 p<0.005) showing a bigger difference from UVT and AVT in younger age.

The relationship between UVT and AVT are tested with correlation. There are a very high correlation, confirmed by partial correlation, corrected for age. The same results were found for ratio.

A comparison between UVT data, AVT data and the vertical time data printout for the 15th percentile rank, showed that the false positives, are only:

3 / 274

And a comparison between Ratio calculated with UVT and AVT data and the data printout for the 15th percentile rank, showed that false negative are:

2 / 274

Conclusion

The vertical time, as widely reported in literature, should not be corrected from errors. Corrections make a faster vertical time and a bigger ratio. Although this difference is small, it could change the results for borderline results at DEM test. Moreover, the difference shown could explain in part the difference of the norms found for Cantonese speaking population that are faster than the American and Spanish norms.

References


mv.manzoli@gmail.com; alessio.facchin@unimib.it