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The Effect of the King-Devick Reading Acceleration Program on Reading Fluency and Comprehension:

A Summary of Randomized Clinical Trials

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STUDY PROFILE

Location: Yorkville School District, Yorkville, IL; Holy Angels and St. Elizabeth Schools, Chicago, IL; Private Elementary School, Madison, WI

Study Duration: 2012-2015

Grades: 1-4

Assessment: Wechsler Individual Achievement Test Third Edition (WIAT) Reading Fluency and Comprehension Subtests; King-Devick Test

Participants: N=611

Protocol: Practice sessions 20 minutes per day, 3 days per

- Results from five randomized-controlled investigations of in-school K-D RAP implementation were combined and analyzed. There were significant reading improvements in students across all reading levels after only 6 weeks of K-D RAP.

Overview

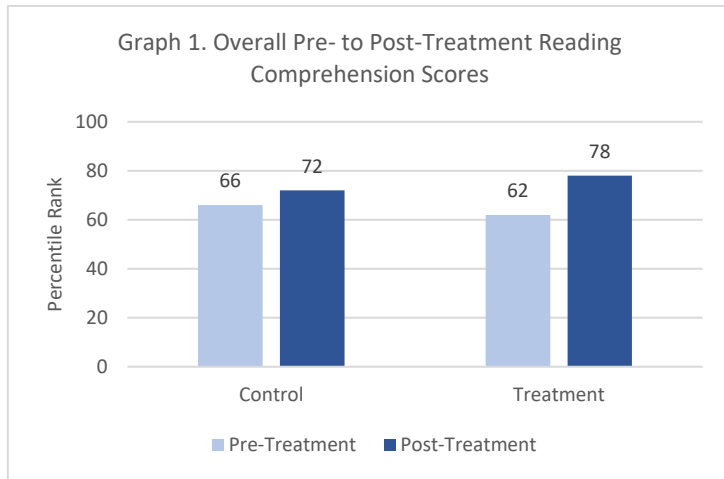
Reading is a complex task involving the integration of language, attention, information processing including eye movements. Efficient eye movements provide a physical foundation for proficient reading and these skills can be improved as multiple studies have reported successful outcomes following training. Data from these studies are summarized and presented to examine the effect of the training program across a wide demographic and large student population. Subgroup analyses further lend insight to ideal timing and length of training.

Study participants were randomized into treatment or control groups. Students in 1st through 4th grade (n=611, 7.0 ± 0.8 years) underwent eighteen, 20-minute sessions utilizing K-D RAP. Reading fluency and comprehension were assessed pre- and post-treatment.

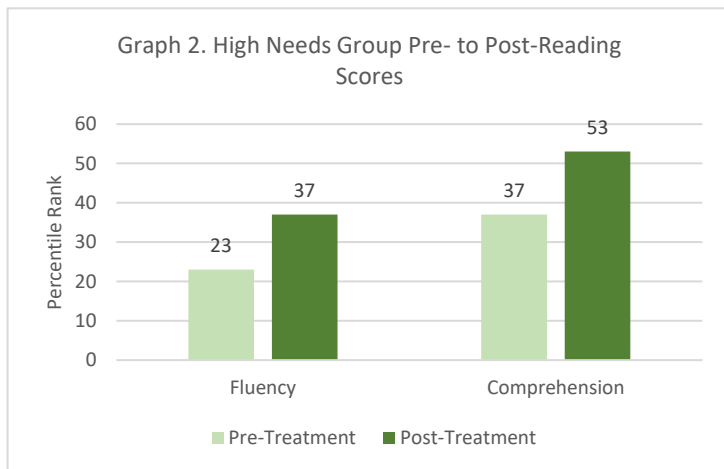
Results

The treatment group had significantly greater improvement compared to the control group in fluency (8.9% vs. 5.9%, p<0.001) and comprehension (9.1% vs. 3.1%, p<0.001, Graph 1). A separate group of high-needs students (n=111) improved significantly and even to a greater degree in fluency and comprehension (Graph 2). Students who fail the K-D Test assessment after the initial 6 weeks of K-D RAP practice benefit from continuing practice, as they demonstrate further improvement with extended practice (Graph 3).

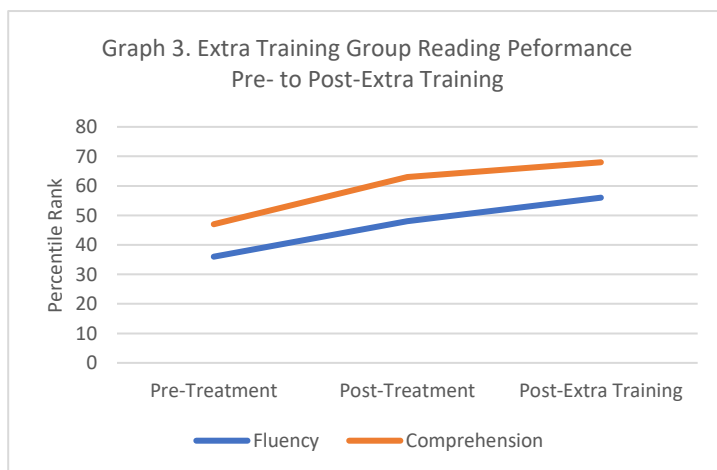
An extra-training group, who received an average of 11 additional treatment sessions, improved significantly in fluency and comprehension following extra-training (p=0.003, p=0.013). During the training, out of 611 there were only 15 students (2.4% of the entire cohort) following treatment who did not improve in reading fluency and 60 students (9.8% of the entire cohort) who did not improve in reading comprehension. Improving reading skills in early on is essential to building the foundations for future academic success.



Graph 1. Pre- to Post Reading Comprehension Scores Comparing Treatment vs Control Group. A Significant Difference was Observed Comparing the Change in Pre- vs Post Scores.



Graph 2. Students who read below grade level, had IEPs, were enrolled in reading remediation programs or were English language learners improved to a greater degree.



Graph 3. Impact of K-D Test RAP Beyond Standard 6 Weeks Implementation

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The Effect of In-School Saccadic Training on Reading Fluency and Comprehension in First and Second Grade Students: A Randomized Controlled Trial

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STUDY PROFILE

Location: Yorkville School District, Yorkville, IL

Study Duration: 2015

Grades: 1-2

Assessment: Wechsler Individual Achievement Test Third Edition (WIAT) Reading Fluency and Comprehension Subtests; King-Devick Test

Participants: N=327

Protocol: Practice sessions 20 minutes every other day for 5 weeks, 18 sessions total.

- Students in 1st and 2nd grade who completed K-D RAP showed significantly greater improvement in reading performance compared to the control group.

Overview

Efficient eye movements provide a physical foundation for proficient reading skills. Researchers investigated the effect of K-D RAP on reading performance. In this cross-over design, study participants (n=327, 165 males; mean age (SD): 7yrs-6mos (1yr-1mo)) were randomized into treatment and control groups then underwent eighteen, 20-minute training sessions over five weeks. Pre- and post-treatment reading assessments included: fluency, comprehension, and rapid number naming performance.

Results

The treatment group had significantly greater improvement compared to the control group in fluency (6.2% vs. 3.6%, p=0.0277) and comprehension (7.5% vs. 1.5%, p=0.0002). A subgroup analysis was performed on high needs students, who were students with an active IEP or in reading recovery programs. Overall, high needs students went from 26th to 40th national percentile rank in reading fluency and from 40th to 56th in comprehension after RAP.

The King-Devick Test, an eye movement test used for reading screening, may be used to predict below-average reading performance. Authors attributed the gains to the repetitive practice of reading-related eye movements, shifting visuospatial attention, and visual processing. Consideration should be given to teaching the physical act of reading within the early education curriculum.

Clin Pediatr. 2014;53(9):858-64



The Effect of Saccadic Training on Early Reading Fluency

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STUDY PROFILE

Location: Holy Angels School, Chicago, IL

Study Duration: 2012-2014

Grades: K-3

Assessment: Wechsler Individual Achievement Test Edition (WIAT) Reading Fluency and Comprehension Subtests; King-Devick Test

Participants: N=110, Longitudinal follow-up: N=15

Protocol: Practice sessions 20 minutes per day, 3 days week, for 6 weeks.

- One and two-year outcome measures for students who previously completed K-D RAP showed that student reading scores not only remained stable but were also substantially higher when compared with peers who did not complete K-D RAP.

Overview

K-D RAP has been shown to result in significant gains in reading performance after 6 weeks of practice during school. The purpose of this study was to evaluate the long-term effects of early K-D RAP implementation. The initial study was a prospective, single-blinded, randomized, crossover trial, a cohort of elementary students received standardized reading fluency testing pre- and posttreatment. Treatment consisted of in-school training 20 minutes per day, 3 days per week for 6 weeks. A convenience sample of student participants still enrolled at the school at a 2-year follow-up that had previously completed K-D RAP were evaluated with the WIAT-III Reading Fluency subtest.

Results

The treatment group had significantly higher reading fluency scores after treatment ($P < 0.001$, Table 1), and post-treatment scores were significantly higher than the control group. Students in 3rd grade who completed K-D RAP in 1st grade, scored at the 71st percentile rank in reading fluency overall, which was greater than the 3rd grade students who did not complete K-D RAP (39th percentile rank). Fourth grade students who completed K-D RAP in 2nd grade had a mean reading fluency percentile rank score of 79th. Students in 5th grade who underwent K-D RAP in 3rd grade showed an average of 84th percentile rank in fluency. Students in 2nd grade who underwent K-D RAP in Kindergarten, scored an average of 59th percentile rank in fluency.

These results showed that gains in reading fluency following K-D RAP not only remained but also continued to improve over the course of 2 years (Figure 1).

Table 1. Reading Fluency Scores Grades 1 through 3

| | Reading Fluency Percentile Rank, mean (SD) | | | | p-value |
|-------------------------|--|----------------|---------------------|---------------------|------------------------|
| | Pre-treatment | Post-treatment | 1yr Follow-up | 2yr Follow-up | |
| Control (n=12) | 42 (33.9) | 48 (37.4) | -- ^a | -- ^a | p < 0.005 ^b |
| Treatment (n=49) | 45 (29.9) | 59 (31.1) | 62 (33.3) (n=25) | 78 (18.4) (n=13) | |
| Grade 1 (n=20) | 38 (24.4) | 52 (29.5) | 62 (33.1) (n=7) | 71 (14.2) (n=3) | p < 0.001 ^c |
| Grade 2 (n=17) | 55 (34.6) | 65 (33.2) | 77 (29.8) (n=10) | 79 (24.0) (n=6) | p < 0.001 ^c |
| Grade 3 (n=12) | 39 (29.4) | 59 (31.2) | 56 (35.8) (n=8) | 84 (12.5) (n=4) | p < 0.001 ^c |

Abbreviations: SD = Standard Deviation
^a No follow-up data on control group due to cross over design
^b Control vs. Treatment group post-treatment comparison
^c Pre-treatment and post-treatment percentile rank comparison

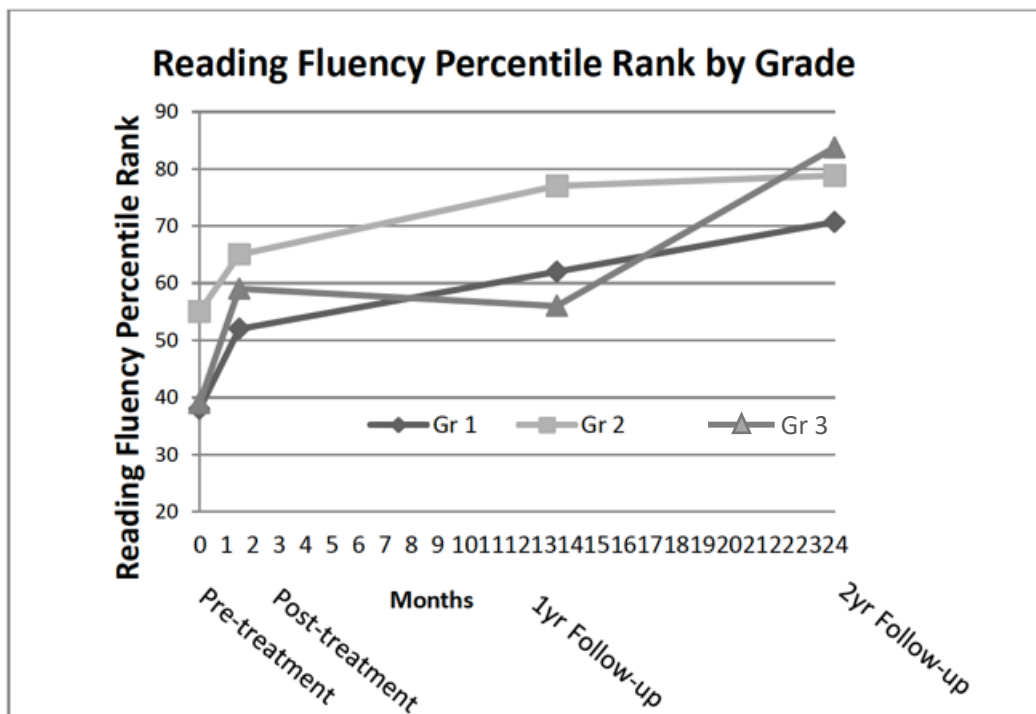


Figure 1. Reading fluency scores by treatment grade

Plots show the mean reading fluency scores from pre- to post-treatment and at the 1-year follow-up for grades 1, 2, and 3. Post-treatment reading fluency scores were significantly higher than pre-treatment across all grades ($P < .001$). One-year follow up reading fluency scores were higher than post-treatment scores. Two-year follow up scores were similarly higher than one-year follow up scores.

Vis Dev Rehabil. 2015;1(2):130-134.



Oculomotor Training using King-Devick Remediation and Elementary School Reading Fluency Outcomes

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STUDY PROFILE

Location: Private Elementary School, Madison, WI

Study Duration: 2014

Grades: 1-4

Assessment: Scholastic Reading fluency Assessment

Participants: N=9

Protocol: Students in Grades 1 and 2 completed 20 minutes of training, 3 days a week for 4 weeks, and then due to school time constraints, completed 10 minutes of training 3 days a week for 2 weeks. Students in Grade 3 and 4 completed 20 minutes of training 3 days a week for 6 weeks.

- Students significantly improved in Scholastic Reading Fluency Assessment measures after participating in K-D RAP after 4-6 weeks.

Overview

K-D RAP has been associated with improvements in reading fluency, but the physical act of reading is not typically taught in schools. The purpose of this retrospective study was to examine reading fluency with the Scholastic Reading Fluency Assessment in elementary students following K-D RAP. Pre- and post-training Scholastic Reading fluency benchmarks were reviewed for nine students (Grades 1 through 4) who had undergone 4-6-week in-school training with K-D RAP.

Results

All students enrolled demonstrated improvement in reading fluency scores following training and this was statistically significant ($p=0.008$, Wilcoxon signed-rank, Figures 1 and 2). These findings support prior research that K-D RAP results in improved reading fluency, utilizing a different reading fluency assessment. The authors attribute the improvement in reading fluency to the rigorous practice of eye movements (saccades) and shifts in visuospatial attention, which are necessary for proficient reading.

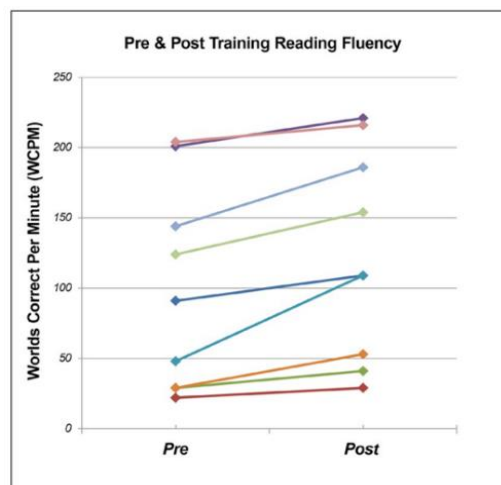


Figure 1: Pre & Post-training Reading Fluency by Student

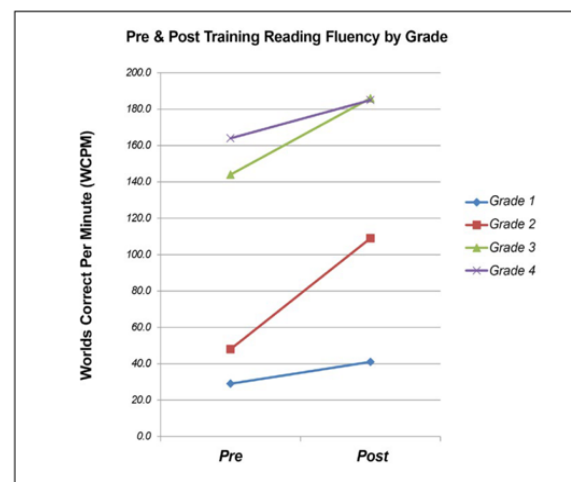


Figure 2: Pre & Post-training Reading Fluency by Grade

Poster Presentation at COVD 2019 Annual Conference



Successful Implementation of the King-Devick Reading Acceleration Program by School Staff

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STUDY PROFILE

Location: Faulk Elementary School, West Memphis, AR

Study Duration: 2018

Grade: 3

Assessments: Reading Fluency and Comprehension Subtests of Wechsler Individual Achievement Test Third Edition (WIAT); Developmental Reading Assessment (DRA); King-Devick Test

Participants: N=34

Protocol: Teachers and teacher's aides supervised students during in-class K-D RAP for 12 minutes per day, 5 days per week for 6 weeks.

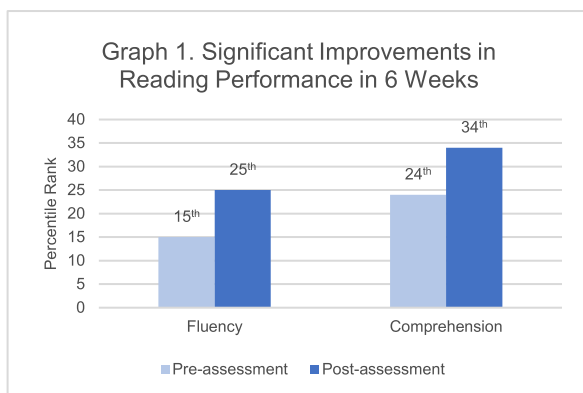
- K-D RAP was implemented by school staff with success; reading performance increased by 10 percentile rank points from Below Average to within an Average range.

Overview

This study aimed to evaluate the implementation of K-D RAP by school staff and the effect on student reading outcomes. Students (n=34) were enrolled from two 3rd grade classes in West Memphis. Teachers and teacher's aides supervised students during in-class K-D RAP intervention 12 minutes/day, 5 days/week for six weeks. Standard reading assessments using WIAT and the King-Devick Test were administered before and after the K-D RAP intervention. Additionally, the school district independently assessed reading fluency and comprehension with the DRA.

Results

The majority of the students in this study read one to two grade levels below the 3rd grade reading level. Median post-KD RAP reading scores significantly improved as compared to pre-KD RAP (WIAT fluency: 15th to 25th percentile rank, $p = 0.0005$); WIAT comprehension: 24th to 34th percentile rank ($p = 0.015$) (Graph 1); DRA fluency 9% improvement, $p = 0.024$; DRA comprehension 7% improvement, $p = 0.014$. Similarly, K-D Test performance improved (speed: 106s vs. 87s; accuracy: 25 errors vs. 6 errors), demonstrating faster and more accurate saccadic function.



Overall, students improved from a Below Average to Average standard reading levels, and student reading performance increased 10 percentile rank points in fluency and comprehension. The school district's reading assessments demonstrated significant improvements when comparing pre- to post-intervention with K-D RAP as well. Significant reading performance gains were achieved with supervision by teachers and teacher's aides.

Vis Dev Rehabil. 2019.



The King-Devick Reading Acceleration Program Significantly Improves Reading Performance in Students with Dyslexia

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STUDY PROFILE

Location: United States, Canada, New Zealand, England, & South Africa

Study Duration: 2018

Grades: 3-6 (required to be at or below a 4th grade reading level)

Assessment: Scholastic Fluency Formula Assessment; King-Devick Test

Participants: N=7

Protocol: K-D RAP was performed for a total of 6 hours spread out over the course of 6-12 weeks at-home.

- Students with dyslexia make large achievements in reading performance following K-D RAP.

Overview

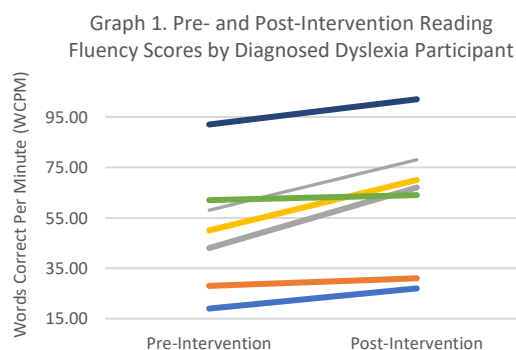
Studies have investigated the effectiveness of K-D RAP for the general student population of early elementary students of all reading levels. This study specifically examined the effect of K-D RAP for students with diagnosed dyslexia.

Multiple studies have shown that students with dyslexia are more likely to have eye tracking inefficiency (or oculomotor dysfunction) compared to students without dyslexia who are reading proficiently.

Results

K-D RAP resulted in significant reading performance gains for students with dyslexia. Students demonstrated an improvement in fluency of 14 WCPM (50 to 64 WCPM). Graph 1 displays individual participant pre- to post-intervention fluency scores. Greater reading fluency improvements were observed in the younger group (9 years of age and younger) compared to the older group (10 years of age and older) (51.2% vs 3.2% improvement).

There is an urgency for implementation, as findings indicate that older students have lower levels of improvement compared to younger students. K-D RAP intervention resulted in significant improvements in reading performance in students with dyslexia.



Presentation at College of Optometrists in Vision Development 2016 Annual Meeting



The Effect of the King-Devick Reading Acceleration Program on Reading Fluency and Comprehension in First and Second Grade Students: A Randomized

Controlled Trial

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STUDY PROFILE

Location: Yorkville School District, Yorkville, IL

Study Duration: 2015

Grades: 1-2

Assessment: Wechsler Individual Achievement Test Third Edition (WIAT) Reading Fluency and Comprehension Tests and the King-Devick Test.

Participants: N=134, High needs group N=25

Protocol: K-D RAP or control training was performed for a total of 6 hours over the course of 5 weeks. The control group was crossed over into treatment with K-D RAP following the initial 5-week study.

- K-D RAP significantly improved reading fluency and comprehension over the course of five weeks (six hours) of in-school training, which was flexibly incorporated into daily 1st and 2nd grade classrooms.

Overview

Efficient eye movements may not be fully developed at the time a child learns to read, resulting in inaccurate saccades, longer fixation, and slower reading. Children with reading disabilities demonstrate reduced saccadic accuracy and speed compared to normal readers. Eye movements, like any motor task, can be trained for improved execution and multiple studies report successful outcomes following training.

In this randomized, controlled, cross-over design, study participants (n=134, 76 males; mean age (SD): 7yrs-6mos (1yr-1mo)) were allocated into treatment and control groups then underwent eighteen, 20-minute training sessions over six weeks utilizing K-D RAP Software. Pre- and post-treatment reading assessments included: fluency, comprehension, and rapid number naming (King-Devick Test) performance.

Results

The treatment group had significantly greater improvement compared to the control group in fluency (14% vs. 11%, p=0.015) and comprehension (12% vs. 5%, p<0.001). The high-needs student group, who were students with active IEPs, in reading remediation, or English language learners, significantly improved in fluency (14%, p<0.001) and comprehension (10%, p<0.001).

Efficient eye movements are one of necessary component of efficient reading that integrate with visual processing, word decoding, attention span; cognitive processing also contributes to successful reading. This study further supports teaching the physical act of reading in the early education curriculum.

Presented at the American Optometric Association's 2012 Annual Meeting in Chicago, IL



The King-Devick Test as a Reading Fluency Training Program for Students in Elementary Schools

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Kattouf, OD, Leonard Messner, OD, Stephanie Messner, OD, Yi Pang, OD, PhD, Alexander Tennant, EdD, Lindsay D. Richardson, MAT

STUDY PROFILE

Location: St. Elizabeth School, Chicago, IL

Study Duration: 2012

Grades: 2-4

Assessments: Scholastic Fluency Test; King-Devick Test

Participants: N=17

Protocol: K-D RAP or control training was performed for a total of 6 hours spread out over the course of 6 weeks

- K-D RAP significantly improved reading fluency for elementary school students.

Overview

The King-Devick Test is an established eye movement test that has been used historically to detect reading disorders related to poor visual-motor skills. Seventeen students in grades 2-4 from the St. Elizabeth School in Chicago Illinois, a predominantly African American K-8 school, were screened for reading inefficiency using the King-Devick Test (K-D Test) and assessed in reading fluency using the Scholastic Fluency Test pre- and post-treatment. The subjects were randomly assigned to receive K-D RAP or placebo treatment. Fourteen received K-D RAP and 3 received placebo treatment. All subjects were masked.

Results

Children in the placebo group averaged a 13-word improvement after treatment whereas the treatment group, who received K-D RAP, had a mean improvement of 30.02 words after treatment. The results demonstrated a statistically significant improvement in the words per minute in children who completed K-D RAP.



Oculomotor Training using KD Remediation Improves Reading Fluency

Benjamin Winters; *Washington Vision Therapy Center*

STUDY PROFILE

Location: High School, Yakima, WA

Study Duration: 2013

Grades: 9-10

Assessment: Reading Curriculum-based measurement reading fluency test (RCBM) and King-Devick Test

Participants: N=53

Protocol: Students were randomized into three groups: K-D RAP, placebo training, or Scholastic Read 180 system, for 12 weeks.

- K-D RAP resulted in significant gains in reading performance in High School students and was supplemental to their current reading remediation programs.

Overview

The purpose of this study was to determine if adding K-D RAP to an existing high school reading program would improve reading fluency outcomes. In this prospective, single-blinded, cross-over trial, of high school students (n=53) in grades 9 and 10 enrolled in the school's 12-week supplemental reading course, all students received reading intervention using Scholastic's Reading 180 system (New York, NY). Students were randomized by classroom into one of the three groups based on their initial training condition. Pre- and post-intervention measures were performed using the K-D Test and Reading Curriculum-Based Measurement (RCBM) reading fluency test.

Results

There was a significantly greater percentage improvement in reading fluency scores (words correct per minute, WCPM) with combined reading remediation with K-D RAP compared to reading intervention with Scholastic Only (7.54% vs. 3.59%, $p = 0.03$).

Over the entire training period there was an average increase of 9.88 WCPM during sessions with K-D RAP, 4.7 WCPM with Scholastic Only and 2.78 WCPM during placebo training. Expected improvement of a successful reading program is an increase of 5 WCPM. In this study, reading intervention coupled with K-D RAP, which resulted in nearly double the expected reading fluency improvement.

Presented at the American Academy of Optometry 2016 Annual Meeting



AMERICAN ACADEMY
of OPTOMETRY

Reading Fluency Measures with Single Word Presentation Verses Left-to-

Right Reading in Third Grade Students

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STUDY PROFILE

Location: Yorkville School District, Yorkville, IL

Study Duration: 2016

Grade: 3

Assessments: Scholastic Fluency Formula Assessment

Participants: N=22

Protocol: Oral reading fluency was measured with single word presentation technology and compared to traditional left-to-right reading.

- Single word presentation reading may be a more efficient method of reading, highlighting the influence of saccadic (eye movement) ability for proficiency in reading.

Overview

Accurate and efficient eye movements are an important aspect to a child's reading performance. Poor readers demonstrate higher rates of eye movement disorders, which may negatively impact reading. Saccadic eye movements direct the eyes to the next word while reading. Single word presentation reading presents each word centered in the screen. The purpose of this study was to measure reading fluency for students using single word presentation reading and traditional left-to-right reading.

In this randomized study, participants (n=22) read 3rd Grade Scholastic Reading Fluency Passages using single word presentation and left-to-right reading. Left-to-right reading was measured by adding the total number of words read correctly in one minute (WCPM). Reading fluency was measured using single word presentation by adjusting the speed of presentation to the maximum speed the student stated words clearly without errors for one minute (WCPM). Students answered three reading comprehension questions following each reading passage.

Results

Students achieved significantly higher reading fluency scores when reading with single word presentation compared with left-to-right reading (mean (SD), 154 (47) WCPM vs 125 (46) WCPM, $p < 0.001$, Wilcoxon signed-rank test). Reading comprehension scores were slightly higher when reading with single word presentation verses left-to-right reading (92% (18) vs 88% (17)), however this was not statistically significant ($p = 0.335$).

On average, students read 28.8 more words per minute while reading with single word presentation compared with left-to-right reading. Single word presentation reading may be a more efficient method of reading and maintain or improve reading comprehension.

Students with Attention Deficit Hyperactivity Disorder

Poster Presentation at American Academy of Neurology 2015 Annual Meeting



Visual Performance Testing in Children and Adolescents with Attention Deficit Hyperactivity Disorder

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STUDY PROFILE

Location: New York, NY

Study Duration: 2015

Ages: 5-21 years

Assessments: King-Devick Test

Participants: N=134

Protocol: K-D Test scores of participants with ADHD were compared to age- and gender-matched controls.

- Children with ADHD showed significantly worse K-D Test scores compared to age and gender-matched controls.

Overview

The King-Devick (K-D) test is a vision-based test of rapid number naming that requires saccades and visual processing. In sideline studies of youth and collegiate athletes with concussion, the K-D test consistently demonstrates higher (worse) time scores post-injury compared to pre-season baseline scores. There is growing evidence that, like concussion and mild traumatic brain injury, ADHD may be associated with visual pathway dysfunction. Using the King-Devick (K-D) test, a vision-based test of rapid number naming that requires saccades and visual processing. We investigated whether children with ADHD has worse scores compared to similar aged controls.

Results

Among 134 participants in this study, ADHD vs. control status was significantly associated with higher K-D test time scores ($p < 0.001$, logistic regression models, accounting for age). K-D showed a greater capacity to distinguish ADHD vs. control groups in youths older than 11 years of age. Patients with ADHD took an average of 14 seconds longer to complete the K-D test, compared to control youth ($p < 0.001$, two-sample t-test). Use of stimulant medications was not associated with differences in K-D time scores within the cohort of patients with ADHD ($p > 0.05$, best KD trial of ADHD on Rx vs. best KD trial of ADHD off Rx).

Visual pathways may perform or be utilized differently in youths with ADHD compared to controls. This alteration in visual performance on the K-D test in youths with ADHD is likely due to the widespread distribution of brain pathways devoted to vision.

Students with Attention Deficit Hyperactivity Disorder

Br J Sports Med. 2017; 51:A81-82

British Journal of
Sports Medicine

Pre-season concussion testing in high school students with academic difficulties or attention deficit hyperactivity disorder

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STUDY PROFILE

Location: High School, Westchester County, NY

Study Duration: 2014-2017

Grades: 9-12

Assessment: King-Devick Test

Participants: N=143, students in contact sports

Protocol: Comparison of three annual concussion baseline K-D Test scores between students with ADHD and those without ADHD.

- High school students with ADHD or other learning difficulty performed significantly worse on the K-D Test compared to students without a learning-related disorder.

Overview

The purpose of this study was to examine cognition and symptom reporting in high school students with academic difficulties or ADHD and compare to those without ADHD at baseline testing. An analysis of three measures routinely given as part of a high school yearly concussion baseline protocol.

Participants included a sample of 143 high school students who participated in collision/contact sports. High school students with academic difficulties or ADHD (n=21) were compared to controls (n=122) for K-D Test, and other concussion testing.

Results

Students with a learning difficulty or ADHD performed significantly worse on the K-D Test compared to students without. Additionally, the high school students with academic difficulties or ADHD performed more poorly on the Visual Motor Speed Composite of ImPACT and reported more symptoms at baseline. Findings suggest these students need to be monitored for specific post-injury changes. Additionally, this highlights how a learning difficulty affects K-D Test performance.

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Visual Performance Testing in Children and Adolescents with ADHD

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STUDY PROFILE

Location: New York, NY

Study Duration: 2016

Ages: 5-21 years

Assessments: King-Devick Test

Participants: N=134

Protocol: K-D Test scores of participants with ADHD were compared to age- and gender-matched controls.

- Visual pathways, as assessed by the K-D Test, may be utilized differently in children and young adults with ADHD who perform the K-D Test slower than controls.

Overview

In the United States, ADHD is the most prevalent pediatric neurodevelopmental disorder. The King-Devick (K-D) test is a vision-based assessment of rapid number naming that requires saccades and visual processing. In sideline testing of young athletes with concussions, the K-D test demonstrated higher score times after a concussive injury as compared to the baseline pre-season scores. ADHD has been linked with visual pathway dysfunction. This investigation looked at whether children with ADHD scored worse or similar to age-matched controls.

Our prospective study looked at children with ADHD and their age-matched controls in patients diagnosed with ADHD between ages 5-21. Analysis compared K-D scores of patients with ADHD to those scores of student-athlete controls matched for age and gender.

Results

Among 134 participants in this study, ADHD vs. control was significantly associated with higher K-D scores ($p < 0.001$). K-D showed a greater capacity to distinguish ADHD in participants older than 11 years of age when compared to controls. Participants with a diagnosis of ADHD required an average of 14 seconds longer to complete the K-D test compared to controls. Stimulant medication use was not associated with differences in K-D scores within the ADHD group.