Effect of Dynavision™ Training on King-Devick Test® Performance

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Effect of Dynavision™ Training on King-Devick Test® Performance

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BACKGROUND AND PURPOSE

- The Dynavision™ is a visual-motor & neurocognitive rehabilitation training device to improve & develop reaction time, central & peripheral vision, used by medical, athletic & tactical patients[1] (Figures 1 & 2)
  - Dynavision ™ is a large board with 64 buttons that randomly illuminating red or green lights, subjects are instructed to quickly strike[2] and has been found to be reliable in clinical research testing and evaluation[3]
  - The unit is able to challenge psychomotor abilities with cognitive challenges provided through the Tachistoscope[1]
  - The small screen, Tachistoscope (T-scope), is able to flash numbers, letter, words, icons or display scrolling text
  - Dynavision™ has also been used to assess, manage and aid in the return-to-play decisions of concussions [3,4]
    - Clark et al., have shown Dynavision™ training to be beneficial in the prevention of concussion occurrence[3,4]
- The King-Devick Test® is a validated, accurate, and objective sideline concussion screening test, executed by having patients rapidly read different arrays of numbers[5]
- King-Devick Test Inc. (K-D) has been used as an evaluation instrument in the assessment of concussion[6]
- K-D test has been found to be a very good concussion management tool with sensitivity of 86% & specificity of 90%[7]
- The purpose of this study was to determine if 6-weeks of Dynavision™ training has a positive affect upon King-Devick Test® performance

PARTICIPANT CHARACTERISTICS

- This study utilized a randomized-control trial (RCT) design
- We had 34 college-aged students volunteers: 21 females, 13 males; 14 in the treatment group, 20 in the control group
  - There were no statistical differences btw genders ($p \leq 0.05$) (Table 2.)
  - There were no statistical differences btw control & treatment groups on the K-D test ($p \leq 0.05$)
  - Gender: Independent samples t-test$_{(30)}$ = 1.98, p = 0.057
  - Control vs. Treatment Group: Independent samples t-test$_{(30)}$ = -0.381, p = 0.706

Table 1.

Mean (± sd)	Age (years)	Ht (cm)	Wt (kg)	BMI
Overall (N = 32)	21.4 (± 3.72)	171.7 (± 10.39)	76.69 (± 19.19)	25.82 (± 4.91)
Males (n = 12)	20.83 (± 1.27)	181.61 (± 6.80)	88.45 (± 20.49)	26.64 (± 5.01)
Females (n = 20)	21.78 (± 4.71)	165.10 (± 6.69)	68.84 (± 13.92)	25.27 (± 4.91)

METHODS

- The K-D test is a timed test administered for baseline (BL) assessment and post-injury test comparison
  - Participants were given an example card & permitted to practice one time
  - This was followed by three K–D test cards, with random, single-digit numbers
  - Participants are asked to read the numbers from left to right across the card as quickly as possible
    - A BL test must be clean, i.e., free of any errors
- Baseline Dynavision™ testing is a series of 10 different tests, each test lasting 1-minute
  - Subjects stood 14" from the unit, the height of the unit is adjusted for each individual
  - Dynavision™ test battery includes:[4]
    - A* test: a 60 sec. warm-up using all lights on the board, subjects react by hitting illuminated buttons
    - Reaction Time Tests: consisted of 3 different tests, assessing reaction time for each arm
      - Test A: subject holds a starting light & reacts to an illuminated button on an adjacent horizontal line
      - Test B: subject holds a starting light & reacts to an illuminated button on a semi-circle of buttons
      - Test C: subject holds a starting light & reacts to a single adjacent, illuminated button
    - Concussion Test 1: subjects react to illuminated buttons while reporting digits seen on the T-scope
    - Concussion Test 2: similar to Test 1, subjects react to illuminated buttons, report the 1st digit on T-scope, then sum the 1st digit with the 2nd digit observed, then repeat summing pairs of digits
    - Concussion Test 3: similar to Test 2, subjects react to strike red illuminated buttons, summing digit pairs, & react to strike & call out green lights as they illuminate
- Following all BL testing subjects were randomly assigned to a treatment or to a control group
- The treatment group completed a series of 3, 1-minute training exercises on the Dynavision™, done 3 X's / week
  - Each treatment group member performed the training exercises for 6 weeks
  - Control group members participated in no training
- Following 6-wk training period, both groups were post-tested (PoT) on the same tests performed at baseline testing

Figure 1.

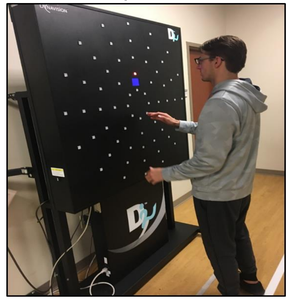

Figure 2.

RESULTS

- Paired samples t-test were performed to the K-D BL data paired with the K-D PoT
  - Tests were performed on all subjects and then by gender
  - All tests were statistically significant at $p < 0.001$ (Table 1,2.)
- 25 of the 32 participants improved on their K-D test times from BL to PoT
  - Mean (± sd) differences between the 2 K-D test administration were:
    - Overall: -3.08 (± 4.45); Males: -2.99 (± 3.40); Females: -3.13 (± 5.06)
- These values shows the Dynavision™ training had a positive affect on King-Devick test scores

Table 2.

	Mean (± sd)	Std. Error Mean	t	df	p-value (2-tailed)
Overall	3.08 (± 4.45)	0.79	3.91	31	0.001
Males	2.99 (± 3.40)	0.98	3.05	11	0.001
Females	3.13 (± 5.06)	1.13	2.76	19	0.001

EVIDENCE-BASED RECOMMENDATIONS / CLINICAL RELEVANCE

- This experiment demonstrated 6 weeks of Dynavision ™ training had a positive affect on King-Devick Test® Performance
- Implementing Dynavision™ training clinically would have significant benefits for injured athletes.
- King-Devick Test® improvements show saccadic and cognitive influences from the Dynavision™

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