**Appendix 2. Literature summary on color vision in ADHD**

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|  | **Objective** | **Participants** | **Method** | **Results** | **Conclusions** |
| Tannock, Martinussen, &Frijters, J. (2000, Journal of Abnormal Child Psychology) | The purpose of the study was to investigate rapid automatized naming (RAN) and effects of stimulant medication in school-age children with ADHD with and without concurrent reading disorder (RD) | 67 children with ADHD, 21 with ADHD + RD, and 27 healthy comparison children participated. All children were between 7-12 years of age, 80% of which were male.In a second study, a subgroup (*n* = 47) of the total ADHD sample participated in an acute medication trial, 35 belonging to the ADHD group, 12 to the ADHD+RD group. | The three groups were compared on: color naming speed, letter naming speed, phonologic decoding, and arithmetic computation.In the medication trial, the subgroup of children completed several academic and cognitive measures as well as three of the RAN Tests: Colors, Letters, and Digits. Each child completed a randomized, placebo-controlled, cross-over trial with three single doses (10, 15, 20 mg) of methylphenidate. The active medication and placebo were administered in a double-blind manner each morning during a 1-week period. Testing under double-blind conditions commenced about 1 hour after ingestion of medication and lasted for 2 hours. | Both ADHD groups were significantly slower in color naming than controls, but did not differ from one another, showing evidence of an association between deficits in color naming and ADHD that could not be attributed to the comorbidity with RD. Methylphenidate selectively improved color-naming speed but had no effect on the speed of naming letters or digits. | The findings of color naming impairments in ADHD challenge the current assumption that naming speed deficits are specific to RD and also provide some support for the purported processing differences underlying color naming and letter naming, of which color-naming speed is improved by stimulant medication. |
| Lawrence et al. (2004, Journal of Attention Disorders) | The purpose of the study was to compare children’s performance on both neuropsychological and real-life measures of executive function and processing speed. | 44 boys aged 6-12 years (mean age 9.7 years), 22 with a diagnosis of ADHD and 22 controls, participated. | Participants completed the Stroop Color-Word Test and Wisconsin Card Sorting Task (WCST), which were selected as neuropsychological measures**,** as well as route tasks in a videogame and at the zoo, which were used to index real-life measures. | There were no group differences in executive function on the Stroop or zoo tasks, but the ADHD group exhibited deficits in set-shifting as assessed by the WCST (preservative errors and responses) and videogame play (fewer challenges completed.The ADHD group was significantly slower in color naming on the Stroop, and also took more trials on the WCST to complete sorting cards according to the first category of color. | There is growing evidence of color naming and color processing deficits in children, adolescents, and adults with ADHD. |
| Banaschewski et al. (2005, Journal of Child Psychology and Psychiatry) | The purpose of the study was to investigate color perception in children with ADHD, as well as the relationship between color perception and performance on a conventional neuropsychological task (Stroop Task) that requires speeded naming of colored stimuli. | 27 children aged 8.0-13.0 years, consisting of 14 children with ADHD and 13 controls, participated. | Color discrimination ability was investigated using the Farnsworth-Munsell 100 Hue Test (FMT). Color vision abnormalities and aptitude were determined by the ability of the child to place the color caps in order of hue. Children completed the Stroop-Color-Word Task. Naming time and errors were recorded for three subtests separately: Stroop-Word, Stroop-Color, and Stroop-Color/Word. A nomination score was calculated in terms of the difference in reaction times of reading of color words and color naming. | Children with ADHD were slower in naming the colors of stimuli on both the Color and Color-Word conditions of the Stroop, but did not differ in naming speed on the Word condition, nor in Stroop interference. This deficit was accounted for similarly by blue-yellow and red-green discrimination abilities. | These findings indicate subtle problems in the blue-yellow mechanism and changes in retinal dopaminergic mechanisms in children with ADHD. However, performance deficits on Stroop color naming seem not to be fully attributable to color vision impairment. |
| Roessner et al. (2008, J Neural Transm) | The purpose of the study is to examine color perception in ADHD and Chronic Tic Disorders (CTD) to clarify which factor (ADHD versus CTD) influences color vision parameters especially in the case of the comorbidity of ADHD+CTD. | 69 children aged 8.0-12.6 years, 14 with a diagnosis of ADHD, 22 with CTD, 19 with ADHD+CTD, 14 healthy controls. | Color discrimination ability was investigated using the Farnsworth-Munsell 100 Hue Test (FMT). Color vision abnormalities and aptitude were determined by the ability of the child to place the color caps in order of hue.Participants also completed theStroop-Color-Word Task. Naming time and errors were recorded for three subtests separately: Stroop-Word,Stroop-Color, and Stroop-Color/Word. | Color perception deficits, as indexed by the FMT, were found for both main factors (ADHD and CTD), but there were no interaction effects. A preponderance of deficits on the blue-yellow compared to the red-green axis was detected for ADHD.In the Stroop task only the ‘pure’ ADHD group showed impairments in interference control and other parameters of Stroop performance.No significant correlations between any FMT variable and color naming in the Stroop task were found. | Basic color perception deficits in both ADHD and CTD could be found, and these deficits are additive in the case of comorbidity (ADHD+CTD). Performance deficits on the Stroop task were present only in the ‘pure’ ADHD group. Hence, the latter may be compensated in the comorbid group by good prefrontal capabilities of CTD. The influence of color perception deficits on Stroop task performance might be negligible. |
| Silva & Frère (2011, BioMedical Engineering OnLine) | The purpose of the study was to examine blue-yellow color discrimination in ADHD individuals using a virtual environment that is capable of quantifying the influence of red-green versus blue-yellow color stimuli on participant performance. | 40 volunteers aged 15-25 years, 17 men and 23 women, consisting of 20 non-ADHD volunteers and 20 volunteers with ADHD participated. | An interactive computer game based on virtual reality was developed to evaluate the performance of the players. Within the game, the player must find and interpret hints scattered in different scenarios. In one version, hints and information boards were painted using red and green colors. In the second version, these objects were painted using blue and yellow colors. The ADHD group and control group were divided into subgroups which played either the red-green version or the yellow-blue version. The time spent to complete each task of the game was measured. | Use of blue/yellow instead of green/red colors decreased the game performance of all participants. However, a greater decrease in performance could be observed with ADHD participants where tasks, that require attention, were most affected. | Colors affect the performance of tasks that simulate daily activities requiring attention in the ADHD population |