

**FTC Research Support Articles
(Abstracts & Citations)**

FILE A-- IQ and Academic Success

- A1 Alloway, T. P., & Copello, E. (2013). Working memory: The what, the why, and the how. *The Australian Educational and Developmental Psychologist, 30*(2), 105-118.**
doi:<http://dx.doi.org/10.1017/edp.2013.13>

ABSTRACT: Working memory, our ability to work with information, plays an important role in learning from kindergarten to the college years. In this article, we review the what, the why, and the how of working memory. First, we explore the relationship between working memory, short-term memory, and long-term memory. We also investigate research on the link between whether environmental factors, such as financial background and mother's educational level, affect working memory. In the next section -- the why of working memory -- we compare the predictive nature of working memory and IQ in learning outcomes. While IQ typically measures the knowledge acquired by the student, working memory measures what they do with that knowledge. Working memory skills are linked to key learning outcomes, including reading and math. In the final section, we present classroom strategies to support working memory. We also review current research on the efficacy of working memory training.

- A2 Evans, C. A. (1988). A study of vigilance, memory processing speed, cognitive ability, and the prediction of academic achievement in children 6-14 years old (Order No. 8907218). Available from ProQuest Dissertations & Theses Full Text. (303709386). Retrieved from <http://search.proquest.com/docview/303709386?accountid=35812>**

ABSTRACT: The subjects in the study were 180 students attending a predominantly white parochial elementary school in a large midwestern city. They had no known sensory, neurological, or severe learning disabilities. Approximately twenty children from each grade level, first through eighth (6-14 years old), half of whom were boys and half girls, participated in the study. The Amherst modification of Hollingshead and Redlich's (1959) Two Factor Index of socioeconomic status was used to determine a global SES index for each family. During school hours, the children were administered two measures. The first of these measures was the Continuous Performance Test of Sustained Attention (CPT), a vigilance task, which consisted of four different test conditions (i.e., conventional numeral, degraded stimulus, hits feedback, and response reversal) designed to test different aspects of cognitive processing. The other measure administered to the children was the Sternberg Test of Short-Term Memory and Concentration. During this test which measures memory processing speed, the child viewed on a video monitor a list of memory set numbers followed by a target number and was then required to indicate whether the target number was or was not a member of the memory set. Data on cognitive ability (Cognitive Abilities Test) and achievement (Iowa Tests of Basic Skills) were obtained from each child's school record. CPT results indicated a significant age x test interaction for each dependent variable of reaction time, hit rate, and false alarm rate. As hypothesized, no sex differences were found. No age x sex interactions were significant. A significant age effect was found for children's performance on speed of memory processing. Overall, the reaction time became faster with increasing age. As predicted, no sex differences were found. Separate regression analyses supported the hypotheses that cognitive ability would be the best predictor of language, mathematics, and composite (overall) achievement. However, contrary to the hypotheses, attention (CPT) and memory (Sternberg) did not significantly predict achievement in either of the three areas. Partial correlational analyses (controlling for age) substantiated several of the predicted interrelationships among measures

- A3 Freberg, M. m., Vandiver, B. J., Watkins, M. W., & Canivez, G. L. (2008). Significant Factor Score Variability and the Validity of the WISC-III Full Scale IQ in Predicting Later Academic Achievement. *Applied Neuropsychology, 15*(2), 131-139. doi:10.1080/09084280802084010**

ABSTRACT: The purpose of this study was to investigate the validity of the WISC-III (Wechsler, 1991) Full Scale

IQ (FSIQ) scores in predicting later academic achievement given significant variability among any of the four WISC-III factor scores. Taken from an archival data set, the sample was composed of 6- to 13-year-old students who were twice evaluated for special education eligibility over approximately a three-year retest interval. Participants were separated into two groups based on the presence or absence of significant factor score variability and then matched across groups on disability, FSIQ, age, sex, and ethnicity. The results of hierarchical multiple regression analyses indicated that the FSIQ was a valid predictor of academic achievement scores even in the presence of significant factor score variability.

- A4 **Gonzalez, J. (2015). Predictive relationships among assessments, academic growth, student cognitive ability and achievement (Order No. 3663821). Available from ProQuest Dissertations & Theses Full Text. (1706878039). Retrieved from**
<http://search.proquest.com/docview/1706878039?accountid=35812>

ABSTRACT: The primary purpose of this study was to examine the predictive validity of the Math Acuity® Predictive assessment (Acuity) on the 2013 Grade 5 New York State Math assessment (NYSMA) and to investigate its predictive relationships with student cognitive ability, as measured by the CogAT, and initial achievement level, as measured by students' scores on the Grade 3. The secondary purpose of this study was to explore the difference in academic growth patterns of students on the NYSMA over a three year period by ability and achievement levels. Archived data of 151 fifth grade students from one elementary school within a Long Island school district were used for analyses. Results showed positive moderate correlations between the Acuity Fall scores and the NYSMA scores in the spring. Stepwise multiple regression analyses were used to determine the predictability of the Acuity scores on the NYSMA with the CogAt scores as an additional independent variable. Significant predictive relationships were found among the Acuity scores and the NYSMA as well as with the cognitive ability. Stepwise multiple regression analyses were used to determine the predictive relationship among the Acuity scores, and cognitive ability, and achievement. The regression analyses demonstrated that the combination of ability and initial achievement did account for 44% of the variance in the Acuity. These findings can assist school districts in making informed decisions on the type of local assessments utilized to both predict student performance and measure student growth. A repeated measures MANOVA on the growth patterns of different ability groups and achievement groups from Grades 3-5 were conducted. A significant interaction effect between time and ability groups was found as the high ability group showed more growth from Grade 3 to Grade 4 in math achievement than low and middle ability groups. However, there was no interaction effect between time and achievement groups. This particular finding has implications for evaluating the positive effects of differentiating instruction and providing students in all ability and achievement groups with more personalized instruction.

- A5 **Hogan, M. J., Parker, J. A., Wiener, J., Watters, C., Wood, L. M., & Oke, A. (2010). Academic success in adolescence: Relationships among verbal IQ, social support and emotional intelligence. *Australian Journal Of Psychology*, 62(1), 30-41. doi:10.1080/00049530903312881**

ABSTRACT: The objective of this study was to examine, by gender, whether emotional intelligence (EI), peer social support, and/or family social support partially mediated the influence of verbal IQ on Grade 10 grade point average (GPA) for 192 students (96 male, 96 female). For male students, EI and peer social support predicted GPA and EI mediated the association between verbal IQ and GPA. For female students, EI, peer social support, and family support predicted GPA but did not mediate the association between verbal IQ and GPA. This study further examined whether subscales of EI (intrapersonal, interpersonal, adaptability, and stress management abilities), peer social support and family social support (emotional, socialising, practical, financial, and advice) added to the prediction of GPA after verbal IQ, gender, and socioeconomic status were controlled. Adaptability, stress management and practical family social support each added to the explanation of variability. None of the peer social support subscales predicted additional variance in GPA.

- A6** **Jedlicka, E. J. (2012). *The real-life benefits of cognitive training* (Order No. 3519139). Available from ProQuest Dissertations & Theses Full Text. (1034901586). Retrieved from <http://search.proquest.com/docview/1034901586?accountid=35812>**

ABSTRACT/Summary: Jedlicka (2012) conducted a quasi-experiment comparing the effects of Learning Rx cognitive training programs on cognitive skills, behavior, and academic achievement. The independent variable was cognitive training (Think Rx, Read Rx, and no training). The dependent variables were attention, processing speed, auditory processing skills, memory skills, visual processing skills, logic and reasoning skills, sensory motor skills, oppositional behavior, and school performance. Consistent with the use of a quasi-experimental design, Jedlicka (2012) grouped his participants ($n = 262$) according to the type of cognitive training program they had already completed. Therefore, participants were not randomly assigned—the key component of experimental studies. Through self-selection into a tuition-based intervention, Group 1 had completed the cognitive training program Think Rx. Group 2 had completed the cognitive training program Read Rx. Group 3 participated in pre-testing and post-testing but had chosen not to undergo training. The use of identical pre and post-test measures (Woodcock-Johnson Tests of Cognitive Abilities) strengthened the design, since it enabled the researcher to determine pre-intervention similarity among the three groups. This helped reduce selection threat to internal validity. Jedlicka (2012) analyzed the data using ANOVA, which indicated that completion of either cognitive training program significantly improved scores on tests of cognitive skills and in academic grades.

- A7** **Scarborough, H. S. (1998). Predicting the future achievement of second graders with reading disabilities: contributions of phonemic awareness, verbal memory, rapid naming, and IQ. *Annals of Dyslexia*, 48, 115-136. doi:10.1007/s11881-998-0006-5**

ABSTRACT: Concurrent and prospective correlations among reading, spelling, phonemic awareness, verbal memory, rapid serial naming, and IQ were examined in a longitudinal sample that was studied at Grade 2 and Grade 8. Substantial temporal stability of individual differences in all of these skills was seen over the six-year period between assessments. The strongest predictors of future reading and spelling outcomes were different for normally achieving second graders than for those who had been designated as having reading disabilities. For the former, Grade 2 literacy scores were the best predictors of later achievement. For the children with reading disabilities, however, prediction of most future reading and spelling skills was substantially improved by the inclusion of the cognitive-linguistic measures, particularly rapid naming.

- A8** **Vitulic, H. S., & Prosen, S. (2012). Personality and Cognitive Abilities as Predictors of University Students' Academic Achievement. *Drustvena Istrazivanja*, 21(3), 715-732. Retrieved from <http://search.proquest.com/docview/1313183563?accountid=35812>**

ABSTRACT: In the current study the students' big five personality traits and specific cognitive abilities were included in predicting their academic achievement: grade point average (GPA) and grades from specific subjects. Two generations of first-year faculty students participated in the research: 203 students of primary education and 80 students of social pedagogy. Using hierarchical multiple regression analyses, non-verbal cognitive abilities, included in the first step of analyses, accounted significantly for 4% of the variance in grade in "science and mathematics" for primary education students, whereas verbal cognitive abilities explained 7% of variance in the GPA of social pedagogy students. The big five personality traits, included in the second step of analyses, significantly improved the prediction of grade in "psychology and didactics", for primary education students and overall grades for social pedagogy students, relative to the predictions based only on the cognitive abilities tests. Among the big five personality traits, measured with BFQ (Caprara et al., 1997), conscientiousness was the only significant predictor of certain grades for both student groups.

- A9** **Weiss, R. V. (1997). *Cognitive ability, classroom learning behavior, and achievement responsibility as predictors of concurrent academic performance* (Order No. 9727314). Available from**

ABSTRACT: Cognitive ability, although a relatively strong predictor of academic achievement, has a demonstrated lack of treatment utility. Two alternatives that also predict academic performance hold more promise for educational and psychological intervention: the manner in which students respond to their teachers in classroom learning situations and the amount of responsibility students take for their own achievement. This study examined the relationship between cognitive ability, learning-related behaviors, achievement responsibility, and their interactions in predicting concurrent academic performance. Two independent samples participated: (a) 180 parochial students in fourth, fifth, and sixth grades and their teachers, and (b) 185 public school students in similar grade levels and their teachers. Students completed the 34-item Intellectual Achievement Responsibility (IAR) scale. Teachers rated student learning behaviors with the 29-item Learning Behaviors Scale. Cognitive ability was measured with the Otis-Lennon School Ability Test, Sixth and Seventh Editions. Teacher-assigned grades in reading, language, and mathematics, and scores on the Stanford Achievement Test, Ninth Edition and Metropolitan Achievement Tests, Seventh Edition served as achievement criteria. After exploring the dimensional structure of the IAR scale, it was found to lack temporal stability and thus an evidential basis for use. However, multiple regression correlation and canonical variate analyses demonstrated that four dimensions of learning-related behavior and their interactions with cognitive ability contributed meaningfully to the prediction of academic achievement. The findings were replicated independently in both samples. The significance of the research is presented in the context of recent legislative efforts to address the needs of all children, especially those traditionally evaluated and placed outside of mainstream classrooms.

- A10 Yen, C. (2002). *Prediction of academic achievement: The roles of cognitive ability and learning behavior* (Order No. 3062139). Available from ProQuest Dissertations & Theses Full Text. (305521010). Retrieved from
<http://search.proquest.com/docview/305521010?accountid=35812>**

ABSTRACT: This study purports to investigate relationships among cognitive ability, learning behavior, and academic achievement across different gender and ethnicity groups, so that the understanding of achievement prediction can be enhanced. The Structural Equation Modeling (SEM) method was adopted to investigate how, and to what extent cognitive ability and learning behavior accounted for academic achievement. The across-gender and across-ethnicity tenability of those relationships was also evaluated by multiple group SEM. A series of nested SEM models, reflecting different hypotheses, were specified a priori and tested against a nationally representative sample of school-age students in the United States ($N = 1304$). The predictive validity of cognitive ability and learning behavior for academic achievement were supported in this study. The unique contribution of learning behavior in achievement prediction, over and above cognitive ability, was also demonstrated. Accordingly, cognitive ability and learning behavior could serve as effective predictors for academic achievement. The non-directional relationship between learning behavior and cognitive ability was supported, however, the directionality of this relationship remained unknown because of the scarcity of research and theory in this area. All relationships among constructs of interest in this study remained invariant across genders and ethnicity. The results provided the evidence for the external validity of findings in this study with respect to gender and ethnicity. Therefore, findings of the current study were generalizable to children from different gender and ethnicity groups.

- A11 Sesma, H., Mahone, E., Levine, T., Eason, S., Cutting, L. (2009). The contribution of executive skills to reading comprehension. *Child Neuropsychology, 15*(3), 232-246. Doi: 10.1080/09297040802220029**

ABSTRACT: Although word recognition deficits (WRD) are a known cause of reading comprehension deficits (RCD), other contributions to RCD, including executive function (EF), have not been fully explored. We examined the contribution of EF (working memory and planning), along with attention, decoding, fluency, and vocabulary to reading comprehension in 60 children (including 16 WRD and 10 RCD), ages 9–15 years. After controlling for commonly accepted contributors to reading comprehension (i.e., attention, decoding skills, fluency, and

vocabulary), EF continued to make a significant contribution to reading comprehension but not to word recognition skills. These findings highlight the need for consideration of the role of EF in RCD.

FILE B-- IQ and Financial Income

- B1 Dreher, G. F., & Bretz, R. D. (1991). Cognitive ability and career attainment: Moderating effects of early career success. *Journal of Applied Psychology, 76*(3), 392-397. Retrieved from <http://search.proquest.com/docview/614301068?accountid=35812>**

ABSTRACT: Three explanations for the prediction that early career success will moderate the relationship between cognitive ability and career attainment are presented, along with an empirical examination of this issue. From longitudinal data provided for 156 managerial, professional, and technical employees, significant moderating effects for an age-graded index of early career success were observed. The relationships between 2 measures of cognitive ability and later career job level were stronger for individuals experiencing lower levels of early career success than for their more successful counterparts. These results agree with the proposition that, for individuals competing without the advantage associated with early career signals of high potential, the acquisition of knowledge, skills, and information is particularly dependent on cognitive ability.

- B2 Dutton, E., & Lynn, R. (2014). Regional differences in intelligence and their social and economic correlates in Finland. *Mankind Quarterly, 54*(3), 447-456.**

ABSTRACT: Regional differences in IQ are reported for Finland showing that average IQs are highest in the south, containing the capital city of Helsinki. It is proposed that the selective migration of those with higher IQs to Helsinki has been the major factor responsible for the higher average IQ in the south. Regional IQs are positively correlated with the percentage of the population with tertiary education, mean income, and average male and female life expectancy; and negatively with the percentage of the population with average income less than 60% of the national median, the percentage of unemployment, and the rate of infant mortality.

- B4 Irwing, P., & Lynn, R. (2006). The relation between childhood IQ and income in middle age. *The Journal of Social, Political, and Economic Studies, 31*(2), 191-196.**

ABSTRACT: Jencks' (1972) classical study Inequality reported a correlation of 0.310 between IQ and income for men in the United States. The present study examines whether this result can be replicated in Britain. Data are reported for a national sample whose intelligence was obtained at the age of 8 years and whose income was obtained at the age 43 years. The correlations between IQ and income were 0.368 for men ($n = 1280$) and 0.317 for women ($n=1085$).

- B5 Lynn, R., & Zietsman, G. (2013). The relation between intelligence and unemployment at the individual and national level. *The Journal of Social, Political, and Economic Studies, 38*(2), 141-147.**

ABSTRACT: It has been shown that there is an association between low intelligence and unemployment among individuals within nations. We explore the question of whether this relationship is present across nations. We find that national rates of unemployment for 107 nations, averaged for the years 2001 and 2008, are correlated with national IQs at $r = -0.66$, and national IQ therefore explains 43.5% of the national variance in unemployment. Corrected for unreliability of both variables, the correlation between national IQ and rates of unemployment is $r = -0.756$ and national IQ explains 57.2% of the national differences in unemployment. Variations in economic freedom independently account for another 12.9% of national rates of unemployment.

- B6 Meisenberg, G., & Lynn, R. (2013). Cognitive human capital and economic growth: Defining the causal paths. *The Journal of Social, Political, and Economic Studies*, 38(1), 16-54.**

ABSTRACT: This study examines two key issues about the role of cognitive human capital (also known as intelligence) for economic growth between 1975 and 2009: (1) the measures of cognitive human capital that are most relevant to the prediction of economic growth; and (2) the proximate mechanisms through which this form of human capital promotes economic growth. We find that cognitive ability, measured as IQ or school achievement, robustly predicts economic growth on a worldwide scale. These two measures can be averaged into a single measure of "intelligence." In multivariate analyses that include a measure of cognitive ability, length of schooling is a poor predictor of economic growth. The growth-promoting effect of cognitive ability is mediated by multiple mechanisms, including lower fertility and greater technological competitiveness in developing countries, and increased domestic saving rate and reduced burden of infectious diseases in all countries. The main conclusion is that rising intelligence has been a major determinant of economic growth in the recent past.

- B7 Murray, C. (1997). IQ and economic success. *Public Interest*, (128), 21-35.**

ABSTRACT/Intro: In *The Bell Curve*, the late Richard J. Herrnstein and I described an emerging class society in which the intellectually blessed become ever more rich and powerful and the intellectually deficient find it harder and harder to cope. We proposed that this new form of class division is substantially (though by no means completely) independent of one's socioeconomic background. As evidence for this thesis, we explored trends in college graduation, stratification of intellectual talent within the university system, the growth of occupations screened for high IQ, and the growing dollar premium for brains in the labor market. We also examined the dark side of the picture: the relationship of IQ to outcomes such as poverty, unemployment, welfare recipiency, and crime. But we never laid out explicitly and in detail the relationship of IQ to one of the most hotly debated topics in contemporary policy studies: income inequality.

- B8 Murray, C. (2002). IQ and Income Inequality in a Sample of Sibling Pairs from Advantaged Family Backgrounds. *American Economic Review*, 92(2), 339-343.
doi:<http://dx.doi.org.contentproxy.phoenix.edu/10.1257/000282802320191570>**

ABSTRACT: The author conducted an analysis of the National Longitudinal Survey of Youth (NLSY) for a publication on **income inequality** and **IQ**. In the course of his work, he produced a sample of 733 **sibling pairs** who grew up in households which, by 1978-1979, had a minimum income of \$30,486 (expressed in 2000 dollars). He dubs these 733 **pairs** the 'utopian sample.' In this article, he uses this utopian **sample** to address the following policy question: How much difference would it make to **income inequality** if, magically, every child in the country could be given the same advantages as the more fortunate of our children? He concludes we must face the reality of human inequality in abilities as a driving force behind inequality in distribution of social and economic goods.

- B9 Ree, M. J., Earles, J. A., & Teachout, M. S. (1994). Predicting job performance: Not much more than g. *Journal of Applied Psychology*, 79(4), 518-524. Retrieved from <http://search.proquest.com/docview/614325470?accountid=35812>**

The roles of general cognitive ability (*g*) and specific abilities or knowledge (*s*) were investigated as predictors of work sample job performance criteria in 7 jobs for US Air Force enlistees. Both *g* and *s* (the interaction of general ability and experience) were defined by scores on the first and subsequent principal components of the enlistment selection and classification test (the Armed Services Vocational Aptitude Battery). Multiple regression analyses, when corrected for range restriction, revealed that *g* was the best predictor of all criteria and that *s* added a statistically significant but practically small amount to predictive efficiency. These results are consistent with those of previous studies, most notably Army Project A (J. J. McHenry et al; see record 1990-27146-001). The study also extends the findings to other jobs and uses traditionally more acceptable estimates of *g*, application of effective sample size in cross-validation estimation, and new performance criteria.

B10 Vanhanen, T. (2011). IQ and international wellbeing indexes. *The Journal of Social, Political, and Economic Studies*, 36(1), 80-89.

ABSTRACT: The ranking list of the best countries in the world published in Newsweek (August 23 & 30, 2010) caused debate on the factors that have helped some countries create better living conditions for people than many other countries, but there was hardly any discussion of the basic causes of the persistence of enormous disparities in human conditions in the world. The purpose of this paper is to compare various indexes measuring human wellbeing from different perspectives and to seek an explanation for their similarities and for the persistence of great disparities. The central argument is that clear differences in the average intelligence of nations (national IQ) explain a main part of the national differences in living conditions measured by various indexes.

FILE C-- IQ and Athletic Achievement

C1 Allen, S. R. (2007). Predicting performance in sport using a portable cognitive assessment device (Order No. 3279907). Available from ProQuest Dissertations & Theses Full Text. (304898135). Retrieved from <http://search.proquest.com/docview/304898135?accountid=35812>

ABSTRACT: Cognitive processing abilities play a vital role in sport performance, and in order to perform at the highest possible level, athletes must be at optimal states of cognitive readiness to compete at the outset of competition. Therefore, athletes may benefit from using a valid and reliable assessment tool that could identify generalized cognitive deficits prior to sport competitions that may be present due to psychological or external stressors. Corrective action could then be taken to counter deficits if they are detected. The quantitative portion of the present study used a single-participant design to assess the predictive ability of a portable cognitive assessment device known as the MiniCog (Shephard & Kosslyn, 2003) on various aspects of performance in sport. Seven participants competing and/or training in five sports were used to determine if performance on the MiniCog test battery would correlate with performance in sport. The primary hypothesis was that sport performance would improve as performance on the MiniCog test battery improved. No consistent trends of support were found in the data, as the seven participants produced correlations of various strength and direction between the MiniCog Rapid Assessment Battery (MRAB) and sport performance. The MiniCog device did not appear to be an accurate predictor of sport performance for the participants in this project, but due to some trends that were seen in the data, the possibility that it could be useful under different conditions or with additional participants cannot be discounted at this time. The qualitative exploration revealed that the five participants who used the MiniCog device prior to athletic events throughout their competitive season suggested that use of the MiniCog appeared to affect their focus, confidence, and anxiety levels in both facilitative and debilitative ways. Also, excessive external distractions, time constraints, and focus on the pending athletic event limited the participants' capacity to implement the MiniCog device into their precompetitive routines successfully. The results from this portion of the project yielded useful recommendations for athletes and their coaches or sport psychologists concerning the feasibility of utilizing a portable assessment device in applied settings.

C2 Cona, G., Cavazzana, A., Paoli, A., Marcolin, G., Grainer, A., & Bisiacchi, P. S. (2015). It's a matter of mind! Cognitive functioning predicts the athletic performance in ultra-marathon runners. *PLoS One*, 10(7) doi:<http://dx.doi.org/10.1371/journal.pone.0132943>

ABSTRACT: The present study was aimed at exploring the influence of cognitive processes on performance in ultra-marathon runners, providing an overview of the cognitive aspects that characterize outstanding runners. Thirty runners were administered a battery of computerized tests right before their participation in an ultra-marathon. Then, they were split according to the race rank into two groups (i.e., faster runners and slower runners) and

their cognitive performance was compared. Faster runners outperformed slower runners in trials requiring motor inhibition and were more effective at performing two tasks together, successfully suppressing the activation of the information for one of the tasks when it was not relevant. Furthermore, slower runners took longer to remember to execute pre-defined actions associated with emotional stimuli when such stimuli were presented. These findings suggest that cognitive factors play a key role in running an ultra-marathon. Indeed, if compared with slower runners, faster runners seem to have a better inhibitory control, showing superior ability not only to inhibit motor response but also to suppress processing of irrelevant information. Their cognitive performance also appears to be less influenced by emotional stimuli. This research opens new directions towards understanding which kinds of cognitive and emotional factors can discriminate talented runners from less outstanding runners.

C3 Fernandes, D. (2004, Dec 18). Brain training ; the interactive metronome works to improve an athlete's concentration and timing. Vijay Singh, the PGA player of the year, has added it to his routine. now a local dad is introducing the program in sarasota. Sarasota Herald Tribune
Retrieved from <http://search.proquest.com/docview/270729089?accountid=35812>

ABSTRACT: [Mike Danski], a certified trainer of the Metronome, said he spoke to Devon's American Legion baseball coach, who said he had noticed a marked difference. Danski's 16-year-old son, Mike, also has ADHD. But since using the Metronome, his father said, Mike has stopped taking medication for that disease and for social anxiety. [Devon Chubek], a junior at Riverview High School, concentrates on the rhythm of the Metronome while his instructor, Mike Danski, who provides coaching with the device, keeps a close eye on his movements at Chubek's home in Sarasota. A laptop computer records performance on the Interactive Metronome.

C4 García-González, L., Moreno, M. P., Moreno, A., Gil, A., & del Villar, F. (2013). Effectiveness of a Video-Feedback and Questioning Programme to Develop Cognitive Expertise in Sport. *Plos ONE*, 8(12), 1-12. doi:10.1371/journal.pone.0082270

ABSTRACT: The importance within sport expertise of cognitive factors has been emphasized in many research studies. Adaptations that take place in athletes' long-term memories are going to condition their decision-making and performance, and training programmes must be developed that improve these adaptations. In our study, we provide a tactical-cognitive training programme based on video-feedback and questioning in order to improve tactical knowledge in tennis players and verify its effect when transferred to athletes' decision-making. 11 intermediate tennis players participated in this study (12.960.7 years old), distributed into two groups (experimental, n = 5; control, n = 6). Tactical knowledge was measured by problem representation and strategy planning with a verbal protocol. Decision-making was measured by a systematic observation instrument. Results confirm the effectiveness of a combination of video-feedback and questioning on cognitive expertise, developing adaptations in long-term memory that produce an improvement in the quality of tactical knowledge (content, sophistication and structure). This, in turn, is transferred to the athletes' decision-making capacity, leading to a higher percentage of successful decisions made during game play. Finally, we emphasize the need to develop effective programmes to develop cognitive expertise and improve athletes' performance, and include it in athletes' formative stages.

C5 Henderson, R. (2010). *The effect of interactive metronome training on sports confidence and putting performance* (Order No. 1486705). Available from ProQuest Dissertations & Theses Full Text. (759799388). Retrieved from <http://search.proquest.com/docview/759799388?accountid=35812>

ABSTRACT: In this study, the effect of Interactive Metronome (IM) on sports confidence and putting performance was examined. The study employed an AB design, involving pre and posttesting, 2 participants completed the putting performance test with a putter, as well as the Sports Confidence Inventory (SCI). The participants completed the putting performance test for the A-phase of the study, yet during the B-phase the participants received 5- to 3-minute sessions of IM. The IM intervention was designed to train the participants to tap their hand

in anticipation of a continuous auditory beat. The results indicate that IM training was one of the variables that led to an increased score on the putting performance test for both participants.

C6 Laird, J. (2014, Oct 07). Getting inside the athlete's brain. *Medical Design News*, Retrieved from <http://search.proquest.com/docview/1630256073?accountid=35812>

ABSTRACT: "Neurologist train regarding injury and brain disease. You need to marry those two. That's what my career has really been all about; bringing the world of neurology and the world of sports medicine together for the common purpose of increasing the neurological care of athletes at all levels. We founded the first sports neurology fellowship in the country. This is our third year in that area. I am happy to say there are others around the country coming on line with this. There is a swell of interest in this area."

He reported that there were all types of computer tests, for things like eye movement and many other things that were not only completely being misused, but misrepresented themselves. "Companies were saying our test can diagnose concussion. It was marketing going overboard. Also, was and is, dangerous," he said. "The FDA was being bombarded with certification requests for such devices to be cleared for concussion diagnosis, but they didn't know anything about the area. So they decided to hold a workshop that I helped format and run. This was about three years ago in June."

C7 Moore, J. C. (2014). *Cognitive, learning and study strategy predictors of student-athlete academic success and academic progress rates* (Order No. 3639185). Available from ProQuest Dissertations & Theses Full Text. (1620540570). Retrieved from <http://search.proquest.com/docview/1620540570?accountid=35812>

ABSTRACT: The purpose of this research was to explore a range of predictor variables believed to influence the academic success of student-athletes as measured by cumulative grade point averages (CGPA) and academic progress rates (APR). This study included 210 scholarship student-athletes participating in intercollegiate athletics at a National Collegiate Athletic Association (NCAA) limited-resource institution. Multiple regression analysis found standardized test scores (Test), high school core grade point averages (HSGPA), the Will composite scale of the Learning and Study Strategies Inventory, 2nd Edition (LASSI-II), gender, and generational status (i.e. first-generation or non-first-generation) to be most predictive of student-athlete cumulative grade point averages (CGPA). Independent t-tests were conducted on all predictor variables in the study and found significant differences between males and females on the variables of HSGPA, Test, and CGPA with female student-athletes scoring higher on all of these measures. Significant differences were also found between first-generation and non-first-generation student-athletes on variables of HSGPA, Test, Skill, Will, and CGPA with non-first-generation student-athletes scoring higher on all of these measures. Student-athletes participating in non-revenue sports had significantly higher scores on the HSGPA, Test, and CGPA variables. Logistic regression analyses using found standardized test scores to be the only predictor variable in this study to consistently contribute to the prediction of APR point loss.

C8 Morgan, T. K. (2006). *A season-long mental skills training program for collegiate volleyball players* (Order No. 3214415). Available from ProQuest Dissertations & Theses Full Text. (304978012). Retrieved from <http://search.proquest.com/docview/304978012?accountid=35812>

ABSTRACT: The purpose of this study was to examine the impact of a season-long mental skills training (MST) program based on a conceptual framework informed by humanism and cognitive-behaviorism on the anxiety, confidence, mental skills usage, quality of life, and performance of an intact team. Participants consisted of a team of 14 female NCAA Division III collegiate volleyball players. The MST program was molded by the players and consisted of relaxation, team building, imagery, goal setting, pre-serve and pre-performance routines, anxiety management, focus words, confidence building, cognitive restructuring (positive self-talk), refocusing after mistakes, and defining roles on the team. The Sport Anxiety Scale (SAS), the Trait Sport-Confidence Inventory

(TSCI), the Athletic Coping Skills Inventory-28 (ACSI), the Test of Performance Strategies (TOPS), and the Athlete Life Quality Scale (ALQS) were given during the pre-season, mid-season, and post-season. Consultant effectiveness was also measured during the post-season using the Sport Psychology (Mental Training) Consultant Evaluation Form. A repeated measures MANOVA revealed no significant differences over time for any of the questionnaires ($F [4, 10] = 2.25, p > .05$), although the TSCI approached significance ($p = .05$). ACSI and TOPS scores were used to assign players to high and low mental skills usage groups. Athletes who reported high usage had significantly lower anxiety and significantly higher confidence than athletes who reported low usage. The players were also grouped based on academic class (freshmen or non-freshmen). Over the season, the anxiety of freshmen increased and the anxiety of non-freshmen decreased. Both freshmen and non-freshmen increased in confidence over time, but non-freshmen had significantly higher confidence than freshmen. Non-freshmen also had significantly higher life quality than freshmen. The high usage players performed significantly better than low usage players for the following statistics: assists/game average, kill percentage, kills/game average, ace/game average, and digs/game average. Overall, it was concluded that the MST program with this team affected athletes differentially and it is recommended that consultants remain flexible with respect to the frequency and content of MST sessions they offer.

- C9** **Simons, J. P. (1988). *The effects of a psychological skills training program on treadmill performance of male collegiate distance runners* (Order No. 8908848). Available from ProQuest Dissertations & Theses Full Text. (303566377). Retrieved from <http://search.proquest.com/docview/303566377?accountid=35812>**

ABSTRACT: Male middle- and long-distance runners ($N = 18$) competing for a National Collegiate Athletic Association Division I track team were studied to evaluate the efficacy of a psychological skills training (PST) program on treadmill running performance. Baseline data were collected on a multi-stage treadmill test at speeds estimated to require 50, 60, 70, 80, 90, and 98% of each runner's aerobic capacity (VO_{max}). The first three stages each lasted 6 min, and the next two stages each lasted 4 min. After 1 min at the final speed, the grade was raised from 0% to 2% and time to volitional termination (TVT) was recorded. Oxygen consumption (VO_2), heart rate, and ventilation were sampled continuously, and self-report measures were collected before, during, and after the test. Subjects were randomized into three equivalent groups. Psychological Skills Training (PST) subjects ($n = 6$) participated in a six week program based upon cognitive-behavioral techniques and expressly designed to address psychological aspects of high intensity running. Specific techniques included relaxation, cognition training, coping skills training, and attention/concentration training. Education Control (EC) subjects ($n = 6$) received information about each of the techniques employed with the PST group, but were neither given specific applications nor encouraged to practice any of the techniques. No Treatment Control (NTC) subjects ($n = 6$) received no intervention. At the end of the six week period, all subjects performed a treadmill test identical to the pre-test and the same measures were collected. Statistical analyses of pre- to post-intervention change scores indicated that PST subjects significantly reduced VO_2 in comparison to EC and NTC subjects ($p < .05$) at speeds estimated to elicit 50, 60, and 70% VO_{max} . No statistical differences were indicated for any of the other physiological data. The PST group also displayed a significantly greater increase in TVT in comparison to the two control groups ($p < .001$). No other measures revealed significant group differences. This investigation provides clear evidence that psychological skills training can significantly influence objective parameters of distance running performance.

- C10** **Voss, M. W., Kramer, A. F., Basak, C., Prakash, R. S., & Roberts, B. (2010). Are expert athletes 'expert' in the cognitive laboratory? A meta-analytic review of cognition and sport expertise. *Applied Cognitive Psychology*, 24(6), 812-826. doi:10.1002/acp.1588**

ABSTRACT/Summary: Recent literature has demonstrated the usefulness of fitness and computer-based cognitive training as a means to enhance cognition and brain function. However, it is unclear whether the combination of fitness and cognitive training that results from years of extensive sport training also results in superior performance on tests of cognitive processes. In this study we examine, in a quantitative meta-analysis ($k=20$), the relationship between expertise in sports and laboratory-based measures of cognition. We found that athletes performed better on

measures of processing speed and a category of varied attentional paradigms, and athletes from interceptive sport types and males showed the largest effects. Based on our results, more research should be done with higher-level cognitive tasks, such as tasks of executive function and more varied sub-domains of visual attention. Furthermore, future studies should incorporate more female athletes and use a diverse range of sport types and levels of expertise.

- C11 Ward, P., Farrow, D., Harris, K. R., Williams, A. M., Eccles, D. W., & Ericsson, K. A. (2008). Training perceptual-cognitive skills: Can sport psychology research inform military decision training? *Military Psychology*, 20, S71-S102. doi:<http://dx.doi.org/10.1080/08995600701804814>**

ABSTRACT: In military and sports tasks, individuals are often required to perform in a complex and dynamic environment and obtain a tactical advantage over an opponent even when only partial or incomplete information is available. Successful performance in both domains is typically dependent upon the ability to work both independently and as a team in an effective manner by combining perceptual, cognitive, motor, and social skills, often under stressful circumstances. Despite these similarities, and the extensive literature bases amassed on training in each field, there has been little, if any, cross-fertilization or collaboration. We offer a synopsis of perceptual-cognitive and decision skills training research from the fields of sport psychology, expert performance, human factors, and military psychology with a view toward highlighting commonalities and differences in approach to training. Attention is drawn to the experimental designs and interventions employed, as well as methodological shortcomings and how these have been addressed. In addition, we highlight the differences in how training recommendations have been derived, discuss questions that have been raised in developing and validating training programs, and, in particular, emphasize the need for evidence-based practice. Our aim is to offer conclusions from the sport psychology literature that can inform the design, structure, content, and implementation of future military decision training.

- C12 Watson, A. M. (2010). *Cognitive and motivational influences on performance during training: A longitudinal field study* (Order No. 3442582). Available from ProQuest Central; ProQuest Dissertations & Theses Full Text. (853143964). Retrieved from <http://search.proquest.com/docview/853143964?accountid=35812>**

ABSTRACT: The purpose of the current study is to investigate how individual factors and early training performance interact to influence subsequent performance in long-term training. Specifically, this longitudinal study sought to identify how motivation and cognitive ability relate to learners' ability to recover from early difficulties during training and demonstrate skill acquisition at the conclusion of training. The sample consisted of 578 military personnel participating in a four to six month foreign language training course required as a part of a broader job training and certification program. Though cognitive ability positively predicted who performed well early in training, motivation to learn did not. Both cognitive ability and motivation to learn predicted the absolute level of skill learners demonstrated after training. However, the influence of cognitive ability and motivation to learn on post-training test performance was not straightforward. A three-way interaction revealed a synergistic influence of cognitive ability and motivation to train, which depended on initial levels of training performance. Among trainees who struggled early on, motivation partially offset the detrimental effects of low cognitive ability on skill acquisition. Among those who began with high performance, motivation in the absence of sufficient cognitive resources appeared to impede skill acquisition. Implications for training research and practice, as well as limitations and directions for future research, are discussed.

- C13 Williams, A. M., Ford, P. R., Eccles, D. W., & Ward, P. (2011). Perceptual-cognitive expertise in sport and its acquisition: Implications for applied cognitive psychology. *Applied Cognitive Psychology*, 25(3), 432-442. doi:<10.1002/acp.1710>**

ABSTRACT/Summary: We review contemporary research on perceptual-cognitive expertise in sport and consider implications for those working in the field of applied cognitive psychology. We identify the important perceptual-cognitive skills that facilitate anticipation in sport and illustrate how these skills interact in a dynamic manner

during performance. We also highlight our current understanding of how these skills are acquired and consider the extent to which the underlying processes are specific to a particular domain and role within that domain. Next, we briefly review recent attempts to facilitate the acquisition of perceptual cognitive expertise using simulation training coupled with instruction and feedback on task performance. Finally, we discuss how research on elite athletes can help inform applied cognitive psychologists who are interested in capturing and enhancing perceptual-cognitive expertise across various domains.

C14 Yarrow, K., Brown, P., & Krakauer, J. W. (2009). Inside the brain of an elite athlete: The neural processes that support high achievement in sports. *Nature Reviews Neuroscience*, 10(8), 585-96. doi:<http://dx.doi.org/10.1038/nrn2672>

ABSTRACT: Events like the World Championships in athletics and the Olympic Games raise the public profile of competitive sports. They may also leave us wondering what sets the competitors in these events apart from those of us who simply watch. Here we attempt to link neural and cognitive processes that have been found to be important for elite performance with computational and physiological theories inspired by much simpler laboratory tasks. In this way we hope to inspire neuroscientists to consider how their basic research might help to explain sporting skill at the highest levels of performance.

C15 Faubert, J. (2013). Professional athletes have extraordinary skills for rapidly learning complex and neutral dynamic visual scenes. *Scientific Reports*, 3, 1154; DOI: 10.1038/srep01154

ABSTRACT: Evidence suggests that an athlete's sports-related perceptual-cognitive expertise is a crucial element of top-level competitive sports¹. When directly assessing whether such experience-related abilities correspond to fundamental and non-specific cognitive laboratory measures such as processing speed and attention, studies have shown moderate effects leading to the conclusion that their special abilities are context-specific². We trained 308 observers on a complex dynamic visual scene task void of context and motor control requirements³ and demonstrate that professionals as a group dramatically differ from high-level amateur athletes, who dramatically differ from non-athlete university students in their capacity to learn such stimuli. This demonstrates that a distinguishing factor explaining the capacities of professional athletes is their ability to learn how to process complex dynamic visual scenes. This gives us an insight as to what is so special about the elite athletes' mental abilities, which allows them to express great prowess in action.

FILE D-- Cognitive Training for Seniors

D1 Branscombe-Caird, L. (2011). *The effects of brain training games on cognitive performance, self-efficacy, and mood* (Order No. MR80611). Available from ProQuest Dissertations & Theses Full Text. (901259231). Retrieved from <http://search.proquest.com/docview/901259231?accountid=35812>

ABSTRACT: With the prevalence of Alzheimer's and other forms of dementia on the rise, a myriad of research has been conducted on memory and attention with the hope of developing new techniques to improve mental processes. The present study investigated the benefits of playing cognitive video games, in particular Nintendo DS's Big Brain Academy, and examined their effects on neuropsychological assessment of different cognitive abilities with increased play. It also examined the effects of brain training on self-ratings of self-perception of cognitive efficacy and mood. The participant sample consisted of 14 healthy individuals (no diagnosis of cognitive impairment) aged 46-55 years. Results showed few significant effects of brain training on cognitive ability, self perception of cognitive efficacy, and mood with the exception of a significant increase in verbal fluency and a significant decrease in anxiety. The present findings provide evidence supporting the specific benefits of brain training and continued mental fitness.

- D2 Bryck, R. L., & Fisher, P. A. (2012). Training the brain: Practical applications of neural plasticity from the intersection of cognitive neuroscience, developmental psychology, and prevention science. *The American Psychologist*, 67(2), 87. Retrieved from <http://search.proquest.com/docview/1011611495?accountid=458>**

ABSTRACT: Prior researchers have shown that the brain has a remarkable ability for adapting to environmental changes. The positive effects of such neural plasticity include enhanced functioning in specific cognitive domains and shifts in cortical representation following naturally occurring cases of sensory deprivation; however, maladaptive changes in brain function and development owing to early developmental adversity and stress have also been well documented. Researchers examining enriched rearing environments in animals have revealed the potential for inducing positive brain plasticity effects and have helped to popularize methods for training the brain to reverse early brain deficits or to boost normal cognitive functioning. In this article, two classes of empirically based methods of brain training in children are reviewed and critiqued: laboratory-based, mental process training paradigms and ecological interventions based upon neurocognitive conceptual models. Given the susceptibility of executive function disruption, special attention is paid to training programs that emphasize executive function enhancement. In addition, a third approach to brain training, aimed at tapping into compensatory processes, is postulated. Study results showing the effectiveness of this strategy in the field of neurorehabilitation and in terms of naturally occurring compensatory processing in human aging lend credence to the potential of this approach.

- D3 Chambon, C., Herrera, C., Romaiguere, P., Paban, V., & Alescio-Lautier, B. (2014). Benefits of computer-based memory and attention training in healthy older adults. *Psychology and Aging*, 29(3), 731-743. doi:<http://dx.doi.org/10.1037/a0037477>**

ABSTRACT: Multifactorial cognitive training programs have a positive effect on cognition in healthy older adults. Among the age-sensitive cognitive domains, episodic memory is the most affected. In the present study, we evaluated the benefits on episodic memory of a computer-based memory and attention training. We targeted consciously controlled processes at encoding and minimizing processing at retrieval, by using more familiarity than recollection during recognition. Such an approach emphasizes processing at encoding and prevents subjects from reinforcing their own errors. Results showed that the training improved recognition performances and induced near transfer to recall. The largest benefits, however, were for tasks with high mental load. Improvement in free recall depended on the modality to recall; semantic recall was improved but not spatial recall. In addition, a far transfer was also observed with better memory self-perception and self-esteem of the participants. Finally, at 6-month follow up, maintenance of benefits was observed only for semantic free recall. The challenge now is to corroborate far transfer by objective measures of everyday life executive functioning.

- D4 Chapman, S., Aslan, A., Specce, J., Hart, J. ...Hanzhang, L. (2015). Neural Mechanisms of Brain Plasticity with Complex Cognitive Training in Healthy Seniors. *Cerebral Cortex*, 25(2), 396-405. Doi: [10.1093/cercor/bht234](https://doi.org/10.1093/cercor/bht234). Available from <http://cercor.oxfordjournals.org/content/25/2/396.full.pdf+html>**

ABSTRACT: Complex mental activity induces improvements in cognition, brain function, and structure in animals and young adults. It is not clear to what extent the aging brain is capable of such plasticity. This study expands previous evidence of generalized cognitive gains after mental training in healthy seniors. Using 3 MRI-based measurements, that is, arterial spin labeling MRI, functional connectivity, and diffusion tensor imaging, we examined brain changes across 3 time points pre, mid, and post training (12 weeks) in a randomized sample ($n = 37$) who received cognitive training versus a control group. We found significant training-related brain state changes at rest; specifically, 1) increases in global and regional cerebral blood flow (CBF), particularly in the default mode network and the central executive network, 2) greater connectivity in these same networks, and 3) increased white matter integrity in the left uncinate demonstrated by an increase in fractional anisotropy. Improvements in cognition were identified along with significant CBF correlates of the cognitive gains. We propose that cognitive training enhances resting-state neural activity and connectivity, increasing the blood supply

to these regions via neurovascular coupling. These convergent results provide preliminary evidence that neural plasticity can be harnessed to mitigate brain losses with cognitive training in seniors.

- D5 Denning, C. R. (2013). *Cognitive training refines connectivity of the aging human brain to improve performance* (Order No. 1537383). Available from ProQuest Dissertations & Theses Full Text. (1364611433). Retrieved from <http://search.proquest.com/docview/1364611433?accountid=35812>**

ABSTRACT: Cognitive deficits that occur as a function of age are highly variable within a sample of older adults of similar age. Training paradigms are available that can reverse cognitive declines that occur with age and improve behavioral performance. However, the benefits of training are also highly variable. The goal of this study was to use functional connectivity analyses on functional MRI data to help identify the source of this variability and to determine if cognitive training could alter network structure in the aging human brain. Resting-state functional connectivity data was acquired to investigate several neural networks in forty-one older adults. Standard functional connectivity and graph theory metrics were used to analyze the structure of networks in the brain. We found that training-related decreases in connectivity were correlated with improvement in behavioral performance on the CRT. This means that training refined network structure to ameliorate behavioral deficits. We also examined baseline connectivity differences between participants who were at high-risk for cognitive decline and those who were at low-risk. Previous studies examining age-related cognitive changes found that older adults' brains were dedifferentiated and suffered from altered connection strengths relative to younger adults. Therefore, we expected to see greater signs of dedifferentiation in our high-risk group. Although there were no significant differences, there were patterns in mean connectivity and mean clustering coefficient that indicated participants who were at high-risk for cognitive decline had stronger functional connectivity compared to participants who were at low-risk for cognitive decline. This would be consistent with dedifferentiation and the results observed with training. Training may be differentiating the system by refining functional connectivity to improve behavioral performance. Further research needs to be done with a larger sample to better investigate differences in connectivity between high-risk and low-risk older adults.

- D6 Edwards, J. D., Ruva, C. L., O'Brien, J. L., Haley, C. B., & Lister, J. J. (2013). An examination of mediators of the transfer of cognitive speed of processing training to everyday functional performance. *Psychology and Aging, 28*(2), 314-321. doi:<http://dx.doi.org/10.1037/a0030474>**

ABSTRACT: The purpose of these analyses was to examine mediators of the transfer of cognitive speed of processing training to improved everyday functional performance (J. D. Edwards, V. G. Wadley,, D. E. Vance, D. L. Roenker, & K. K. Ball, 2005, The impact of speed of processing training on cognitive and everyday performance. *Aging & Mental Health, 9*, 262–271). Cognitive speed of processing and visual attention (as measured by the Useful Field of View Test; UFOV) were examined as mediators of training transfer. Secondary data analyses were conducted from the Staying Keen in Later Life (SKILL) study, a randomized cohort study including 126 community dwelling adults 63 to 87 years of age. In the SKILL study, participants were randomized to an active control group or cognitive speed of processing training (SOPT), a nonverbal, computerized intervention involving perceptual practice of visual tasks. Prior analyses found significant effects of training as measured by the UFOV and Timed Instrumental Activities of Daily Living (TIADL) Tests. Results from the present analyses indicate that speed of processing for a divided attention task significantly mediated the effect of SOPT on everyday performance (e.g., TIADL) in a multiple mediation model accounting for 91% of the variance. These findings suggest that everyday functional improvements found from SOPT are directly attributable to improved UFOV performance, speed of processing for divided attention in particular. Targeting divided attention in cognitive interventions may be important to positively affect everyday functioning among older adults.

- D7 Faille, L. (2006). *Performance on a brain-plasticity-based memory-training computer program for the elderly as influenced by cognitive functioning and gender* (Order No. 3255967). Available from**

ABSTRACT: Data from a pilot study on the effectiveness of a brain-plasticity-based memory-training program were analyzed to assess the impact of cognitive functioning and gender on participant performance. It was predicted that participants with possible mild cognitive impairment would receive greater benefit from the intervention than participants with either no cognitive impairment or possible mild dementia. It also was predicted that females would receive greater benefit from the intervention than males due to their pre-existing verbal skills. Hypotheses regarding gender were unconfirmed, and hypotheses regarding participants with possible mild cognitive impairment improving more than unimpaired participants in the areas of neurocognitive status and working memory also were unconfirmed. The hypotheses that participants with possible mild cognitive impairment would outperform cognitively intact participants in the domain of language production proved accurate, which may have implications regarding the existence of brain plasticity in the area of language production. Although only one hypothesis was confirmed, other meaningful information was gleaned from the data. RBANS Total Index change scores were higher for participants in the treatment group than in the composite control group. Additionally, women also improved in the realm of working memory between pre and post testing. These findings suggest that individuals with either no impairment or possible mild cognitive impairment may respond similarly to the brain-plasticity-based memory-training program in the domain of neurocognitive functioning. Likewise, the findings also suggest that men and women may respond similarly to the memory-training program. Finally, there is a need for further research. Indeed, further research on this program with a larger, more representative sample as well as a better controlled design are recommended for obtaining additional information about the efficacy and utility of the brain-plasticity based memory training program.

- D8 Fairchild, J. K., Friedman, L., Rosen, A. C., & Yesavage, J. A. (2013). Which older adults maintain benefit from cognitive training? Use of signal detection methods to identify long-term treatment gains. *International Psychogeriatrics*, 25(4), 607-16.
doi:<http://dx.doi.org/10.1017/S1041610212002049>**

ABSTRACT: Cognitive training has been shown to improve memory in older adults; however, little is known about which individuals benefit from or respond best to training in the long term. Identification of responders' characteristics would help providers match cognitive interventions to individuals to improve their effectiveness. Signal detection methods may prove more informative than more commonly used analytic methods. The goal of the current study is to identify baseline characteristics of long-term treatment responders and of those able to maintain their initial benefit from cognitive training. Methods: Participants were 120 non-demented, community-dwelling older adults who had participated in a cognitive training intervention. Tested predictors included both demographic and neurocognitive variables. Primary outcome variables were performance on measures of memory at one-year follow-up. Results: Results of the signal detection analysis indicated that different neurocognitive performances predicted long-term effects of memory training and maintenance of initial treatment response according to different types of to-be-remembered material. Higher baseline scores on tests of associative memory, delayed verbal memory, attention, episodic memory, and younger age were found predictive of long-term response one year later. Higher associative memory scores and lower initial gains at the end of treatment (week 14) predicted successful maintenance of training gains at week 52. Conclusions: To derive long-term benefit from particular cognitive training programs, it appears necessary for older adults to have specific neurocognitive profiles. Further, inclusion of booster sessions to cognitive training programs may assist in maintenance of initial treatment gains.

- D9 Hardy, J. L., Nelson, R. A., Thomason, M. E., Sternberg, D. A., Katovich, K., Farzin, F., & Scanlon, M. (2015). Enhancing cognitive abilities with comprehensive training: A large, online, randomized, active-controlled trial. *PLoS One*, 10(9)
doi:<http://dx.doi.org/10.1371/journal.pone.0134467>**

ABSTRACT: A variety of studies have demonstrated gains in cognitive ability following cognitive training interventions. However, other studies have not shown such gains, and questions remain regarding the efficacy of

specific cognitive training interventions. Cognitive training research often involves programs made up of just one or a few exercises, targeting limited and specific cognitive endpoints. In addition, cognitive training studies typically involve small samples that may be insufficient for reliable measurement of change. Other studies have utilized training periods that were too short to generate reliable gains in cognitive performance.

Methods: The present study evaluated an online cognitive training program comprised of 49 exercises targeting a variety of cognitive capacities. The cognitive training program was compared to an active control condition in which participants completed crossword puzzles. All participants were recruited, trained, and tested online ($N = 4,715$ fully evaluable participants). Participants in both groups were instructed to complete one approximately 15-minute session at least 5 days per week for 10 weeks.

Results: Participants randomly assigned to the treatment group improved significantly more on the primary outcome measure, an aggregate measure of neuropsychological performance, than did the active control group (Cohen's d effect size = 0.255; 95% confidence interval = [0.198, 0.312]). Treatment participants showed greater improvements than controls on speed of processing, short-term memory, working memory, problem solving, and fluid reasoning assessments. Participants in the treatment group also showed greater improvements on self-reported measures of cognitive functioning, particularly on those items related to concentration compared to the control group (Cohen's d = 0.249; 95% confidence interval = [0.191, 0.306]).

Conclusion: Taken together, these results indicate that a varied training program composed of a number of tasks targeted to different cognitive functions can show transfer to a wide range of untrained measures of cognitive performance.

D10 Hudak, E. M. (2012). *The effects of cognitive stimulation and computerized memory training among older adults residing in independent-living facilities* (Order No. 3521784). Available from ProQuest Central; ProQuest Dissertations & Theses Full Text. (1038970688). Retrieved from <http://search.proquest.com/docview/1038970688?accountid=35812>

ABSTRACT: With age, older adults experience declines in both short- and long-term memory. One way to counter these age-related declines is through memory interventions, which include computerized cognitive training and noncomputerized cognitive stimulation. This dissertation examined whether a cognitive training program, Dakim BrainFitness (Dakim Inc., 2002) and a program of cognitive stimulation, Mind Your Mind (Seagull & Seagull, 2007), enhance memory performance among cognitively-intact older adults residing in independent-living retirement communities. Specifically, the following research questions were proposed: (a) How effective is the computerized cognitive training program in improving memory performance relative to the cognitive stimulation program or a no-contact control condition? (b) How effective is the noncomputerized cognitive stimulation program, Mind Your Mind, at improving memory performance relative to a control condition? and (c) Will memory training gains endure 3-months post-training for those who participate in cognitive training?

Method: Fifty-three older adults were randomized to cognitive training ($n = 19$), cognitive stimulation ($n = 17$), or a no-contact control ($n = 17$) condition.

D11 Kueider, A. M., Parisi, J. M., Gross, A. L., & Rebok, G. W. (2012). Computerized cognitive training with older adults: A systematic review. *PLoS One*, 7(7)
doi:<http://dx.doi.org/10.1371/journal.pone.0040588>

ABSTRACT: A systematic review to examine the efficacy of computer-based cognitive interventions for cognitively healthy older adults was conducted. Studies were included if they met the following criteria: average sample age of at least 55 years at time of training; participants did not have Alzheimer's disease or mild cognitive impairment; and the study measured cognitive outcomes as a result of training. Theoretical articles, review articles, and book chapters that did not include original data were excluded. We identified 151 studies published between 1984 and 2011, of which 38 met inclusion criteria and were further classified into three groups by the type of computerized program used: classic cognitive training tasks, neuropsychological software, and video games. Reported pre-post training effect sizes for intervention groups ranged from 0.06 to 6.32 for classic cognitive training interventions, 0.19 to 7.14 for neuropsychological software interventions, and 0.09 to 1.70 for video game interventions. Most studies reported older adults did not need to be technologically savvy in order to successfully

complete or benefit from training. Overall, findings are comparable or better than those from reviews of more traditional, paper-and-pencil cognitive training approaches suggesting that computerized training is an effective, less labor intensive alternative.

D12 Mahncke, H., Connor, B., Appelman, J., Ahsanuddin, O. ...Merzenich, M. (2006). Memory enhancement in healthy older adults using a brain plasticity-based training program: A randomized controlled study. *Proceedings of the National Academy of Sciences*, 103(33), 12523-12528. doi: 10.1073/pnas.0605194103

ABSTRACT: Normal aging is associated with progressive functional losses in perception, cognition, and memory. Although the root causes of age-related cognitive decline are incompletely understood, psychophysical and neuropsychological evidence suggests that a significant contribution stems from poorer signal-to-noise conditions and down-regulated neuromodulatory system function in older brains. Because the brain retains a lifelong capacity for plasticity and adaptive reorganization, dimensions of negative reorganization should be at least partially reversible through the use of an appropriately designed training program. We report here results from such a training program targeting age-related cognitive decline. Data from a randomized, controlled trial using standardized measures of neuropsychological function as outcomes are presented. Significant improvements in assessments directly related to the training tasks and significant generalization of improvements to nonrelated standardized neuropsychological measures of memory (effect size of 0.25) were documented in the group using the training program. Memory enhancement appeared to be sustained after a 3-month no-contact follow-up period. Matched active control and no-contact control groups showed no significant change in memory function after training or at the 3-month follow-up. This study demonstrates that intensive, plasticity-engaging training can result in an enhancement of cognitive function in normal mature adults.

D13 Sorenson, S. M. (2012). *The neuropsychological functioning of older adults pre- and post-cognitive training with a brain plasticity-based computerized training program* (Order No. 1531851). Available from ProQuest Dissertations & Theses Full Text. (1283120426). Retrieved from <http://search.proquest.com/docview/1283120426?accountid=458>

ABSTRACT: The present study evaluates the effectiveness of Posit Science Cortex(TM) with Insight Drive Sharp(TM) as a tool for improving neuropsychological functioning in a normal aging sample. The purpose of the DriveSharp(TM) training program is to help an individual improve his or her visual attention and useful field of view. Each exercise continually adapts to the individual's performance so that the training is always at an appropriate level for that specific person. Thirty-two healthy older adult participants were randomly assigned to either the active intervention group (DriveSharp(TM)) or a waitlist control group. Participants in the intervention group were required to engage in training at its recommended dosing (60 min/day, 5 days/week, 2 weeks). All participants were given identical neuropsychological assessments to measure change in various realms of cognitive functioning. The Trail Making Test (Reitan, 1986) and the Useful Field of View test (UFOV; Edwards, Vance, et al., 2005) were used to assess the areas of cognition that DriveSharp(TM) was designed to train (visual attention and information processing), and the Raven's Progressive Matrices test (Raven, 1962) was used to measure area of cognition that is not directly trained by the program: fluid intelligence. It was hypothesized that participants undergoing the intervention would experience improvement in both the trained and untrained neuropsychological measures, and that the performance gain on the measure of fluid intelligence would be the result of the variance shared between fluid intelligence and the more fundamental, directly-trained cognitive abilities. Results revealed a statistically significant improvement on Trail Making Test A/C and the UFOV Selective Attention subtest for the total sample that received training. There was also evidence of a training effect on the UFOV Divided Attention subtest, though this improvement was not statistically significant. These results indicate that the DriveSharp(TM) program may improve specific aspects of visual attention related to selective attention and inhibition of irrelevant information. No significant change in performance was seen on the UFOV Processing Speed subtest (a measure of a cognitive area claimed to be directly trained by the DriveSharp(TM) program). Additionally, there was no significant improvement in performance on the Raven's Progressive Matrices, indicating no improvement due to

training in more complex abilities, such as fluid intelligence.

- D14 Smith, G., Housen, P., Yaffe, K., Ruff, R., Kennison, R., Mahncke, H., & Zelinski, E. (2009). A cognitive training program based on principles of brain plasticity: results from the Improvement in Memory with Plasticity-based Adaptive Cognitive Training (IMPACT) study. *Journal Of The American Geriatrics Society*, 57(4), 594-603 10p. doi:10.1111/j.1532-5415.2008.02167.x**

ABSTRACT: To investigate the efficacy of a novel brain plasticity-based computerized cognitive training program in older adults and to evaluate the effect on untrained measures of memory and attention and participant-reported outcomes. **DESIGN:** Multisite randomized controlled double-blind trial with two treatment groups. **SETTING:** Communities in northern and southern California and Minnesota. **PARTICIPANTS:** Community-dwelling adults aged 65 and older (N=487) without a diagnosis of clinically significant cognitive impairment. **INTERVENTION:** Participants were randomized to receive a broadly-available brain plasticity-based computerized cognitive training program (intervention) or a novelty- and intensity-matched general cognitive stimulation program modeling treatment as usual (active control). Duration of training was 1 hour per day, 5 days per week, for 8 weeks, for a total of 40 hours. **MEASUREMENTS:** The primary outcome was a composite score calculated from six subtests of the Repeatable Battery for the Assessment of Neuropsychological Status that use the auditory modality (RBANS Auditory Memory/Attention). Secondary measures were derived from performance on the experimental program, standardized neuropsychological assessments of memory and attention, and participant-reported outcomes. **RESULTS:** RBANS Auditory Memory/Attention improvement was significantly greater ($P=.02$) in the experimental group (3.9 points, 95% confidence interval (CI)=2.7-5.1) than in the control group (1.8 points, 95% CI=0.6-3.0). Multiple secondary measures of memory and attention showed significantly greater improvements in the experimental group (word list total score, word list delayed recall, digits backwards, letter-number sequencing; $P<.05$), as did the participant-reported outcome measure ($P=.001$). No advantage for the experimental group was seen in narrative memory. **CONCLUSION:** The experimental program improved generalized measures of memory and attention more than an active control program.

- D15 Szelag, E., & Skolimowska, J. (2012). Cognitive function in elderly can be ameliorated by training temporal information processing. *Restorative Neurology & Neuroscience*, 30(5), 419-434.**

ABSTRACT: The study offers a promising direction for rehabilitation; as for the first time cognitive benefits of training in temporal information processing (TIP) using Fast ForWord were identified in elderly adults. As TIP creates a fundamental basis for human cognition, we focused on two questions: (1) can TIP be improved by Fast ForWord training? (2) can a transfer of the trained skill from the time domain to the untrained cognitive domain be observed after the training? **Methods:** 30 healthy seniors were classified according to three groups which underwent either temporal Fast ForWord training (Group A) or non-temporal control training (Group B). Group C was comprised of non-active controls. Various cognitive functions, i.e., TIP, as well as some aspects of attention and short-term memory, were compared before and after the training. **Results:** Only for Group A was the improved TIP accompanied by amelioration of both attentional and memory resources. The observed improvements were maintained for up to 18 months. Although in Group B some improvements in TIP were also evidenced after the training, significant improvements were observed neither in Group B nor C. **Conclusions:** Temporal training is effective for amelioration of cognitive function in seniors. Its application may foster improved life quality in increasingly aging societies.

- D16 Zelinski, E. M., Spina, L. M., Yaffe, K., Ruff, R., Kennison, R. F., Mahncke, H. W., & Smith, G. E. (2011). Improvement in memory with plasticity-based adaptive cognitive training: results of the 3-month follow-up. *Journal Of The American Geriatrics Society*, 59(2), 258-265 8p. doi:10.1111/j.1532-5415.2010.03277.x**

OBJECTIVES: To investigate maintenance of training effects of a novel brain plasticityDSbased computerized cognitive training program in older adults after a 3-month no-contact period. **DESIGN:** Multisite, randomized, controlled, double-blind trial with two treatment groups. **SETTING:** Communities in northern and southern California and Minnesota. **PARTICIPANTS:** Four hundred eighty-seven community dwelling adults aged 65 and older without diagnosis of clinically significant cognitive impairment. **INTERVENTION:** Random assignment into a broadly available brain plasticityDSbased computerized cognitive training program experimental group or a novelty- and intensity- matched cognitive stimulation active control. Assessments at baseline, after training, and at 3 months. **MEASUREMENTS:** The primary outcome was a composite of auditory subtests of the Repeatable Battery for the Assessment of Neuropsychological Status. Secondary measures included trained task performance, standardized neuropsychological assessments of overall memory and attention, and participant-reported outcomes (PROs). **RESULTS:** A significant difference in improvement from baseline to 3-month follow-up was seen between the experimental training and control groups on the secondary composite of overall memory and attention, ($P<0.01$, $d=0.25$), the trained processing-speed measure ($P<0.001$, $d=0.80$), word list total recall ($P<0.004$, $d=0.28$), letterDSnumber sequencing ($P<0.003$, $d=0.29$), and the cognitive subscale of PRO ($P<0.006$, $d=0.27$). Previously significant improvements became nonsignificant at the 3-month follow-up for the primary outcome, two secondary measures of attention and memory, and several PROs. Narrative memory continued to show no advantage for the experimental group. Effect sizes from baseline to follow-up were generally smaller than effect sizes from baseline to posttraining. **CONCLUSION:** Training effects were maintained but waned over the 3-month no-contact period.

D17 Willis, S.L., Tennstedt, S.L., Marsiske, M., et al. (2006). Long-term Effects of Cognitive Training on Everyday Functional Outcomes in Older Adults. *JAMA*, 296(23), 2805-2814.
doi:10.1001/jama.296.23.2805.

ABSTRACT: Context- Cognitive training has been shown to improve cognitive abilities in older adults but the effects of cognitive training on everyday function have not been demonstrated. Objective- To determine the effects of cognitive training on daily function and durability of training on cognitive abilities. Design, Setting, and Participants- Five-year follow-up of a randomized controlled single-blind trial with 4 treatment groups. A volunteer sample of 2832 persons (mean age, 73.6 years; 26% black), living independently in 6 US cities, was recruited from senior housing, community centers, and hospitals and clinics. The study was conducted between April 1998 and December 2004. Five-year follow-up was completed in 67% of the sample. Interventions- Ten-session training for memory (verbal episodic memory), reasoning (inductive reasoning), or speed of processing (visual search and identification); 4-session booster training at 11 and 35 months after training in a random sample of those who completed training. Main Outcome Measures- Self-reported and performance-based measures of daily function and cognitive abilities. Results- The reasoning group reported significantly less difficulty in the instrumental activities of daily living (IADL) than the control group (effect size, 0.29; 99% confidence interval [CI], 0.03-0.55). Neither speed of processing training (effect size, 0.26; 99% CI, -0.002 to 0.51) nor memory training (effect size, 0.20; 99% CI, -0.06 to 0.46) had a significant effect on IADL. The booster training for the speed of processing group, but not for the other 2 groups, showed a significant effect on the performance-based functional measure of everyday speed of processing (effect size, 0.30; 99% CI, 0.08-0.52). No booster effects were seen for any of the groups for everyday problem-solving or self reported difficulty in IADL. Each intervention maintained effects on its specific targeted cognitive ability through 5 years (memory: effect size, 0.23 [99% CI, 0.11-0.35]; reasoning: effect size, 0.26 [99% CI, 0.17-0.35]; speed of processing: effect size, 0.76 [99% CI, 0.62-0.90]). Booster training produced additional improvement with the reasoning intervention for reasoning performance (effect size, 0.28; 99% CI, 0.12-0.43) and the speed of processing intervention for speed of processing performance (effect size, 0.85; 99% CI, 0.61-1.09). Conclusions- Reasoning training resulted in less functional decline in self-reported IADL. Compared with the control group, cognitive training resulted in improved cognitive abilities specific to the abilities trained that continued 5 years after the initiation of the intervention.

FILE E-- Cognitive Training for TBI

- E1 Giles, G. M. (2010). Cognitive versus functional approaches to rehabilitation after traumatic brain injury: Commentary on a randomized controlled trial. *The American Journal of Occupational Therapy*, 64(1), 182-5. Retrieved from
<http://search.proquest.com/docview/231970187?accountid=35812>**

ABSTRACT/Summary: I describe the findings of one of the largest randomized controlled trials (RCTs) of rehabilitation after traumatic brain injury (TBI) ever conducted, examine the theoretical relationship between cognitive and functional rehabilitation after TBI, and describe the historical preference for cognitive (top-down) rather than functional (bottom up) interventions. I also contrast the goals and principles of cognitive rehabilitation and of the neurofunctional approach of Giles and Clark-Wilson (1993; Giles, 2005)—a bottom-up approach. Findings of the RCT provide empirical support for both functional and cognitive interventions following acute TBI. In addition, they provide evidence that each type of intervention offers significant advantages for a specific subpopulation. The clinical implications of these findings for occupational therapy practitioners are discussed.

- E2 Johansson, B. B. (2011). Current trends in stroke rehabilitation. A review with focus on brain plasticity. *Acta Neurologica Scandinavica*, 123(3), 147-159. doi:10.1111/j.1600-0404.2010.01417.x**

ABSTRACT: Current understanding of brain plasticity has lead to new approaches in ischemic stroke rehabilitation. Stroke units that combine good medical and nursing care with task-oriented intense training in an environment that provides confidence, stimulation and motivation significantly improve outcome. Repetitive transcranial magnetic stimulation (rTMS), and trans-cranial direct current stimulation (tDCS) are applied in rehabilitation of motor function. The long-term effect, optimal way of stimulation and possibly efficacy in cognitive rehabilitation need evaluation. Methods based on multisensory integration of motor, cognitive, and perceptual processes including action observation, mental training, and virtual reality are being tested. Different approaches of intensive aphasia training are described. Recent data on intensive melodic intonation therapy indicate that even patients with very severe non-fluent aphasia can regain speech through homotopic white matter tract plasticity. Music therapy is applied in motor and cognitive rehabilitation. To avoid the confounding effect of spontaneous improvement, most trials are preformed ≥ 3 months post stroke. Randomized controlled trials starting earlier after strokes are needed. More attention should be given to stroke heterogeneity, cognitive rehabilitation, and social adjustment and to genetic differences, including the role of BDNF polymorphism in brain plasticity.

- E3 Kinney, A. (2001). Cognitive therapy and brain-injury: Theoretical and clinical issues. *Journal of Contemporary Psychotherapy*, 31(2), 89. Retrieved from
<http://search.proquest.com/docview/217674901?accountid=35812>**

ABSTRACT: The present manuscript examines the conceptual and practical issues of cognitively oriented psychotherapeutic methods to those individuals suffering from brain-injury. The manuscript briefly reviews various types of brain-injuries, associated cognitive and emotional changes, and the implications of cognitive deficits for the practice of cognitively oriented psychotherapy. In particular, the practice of Rational-Emotive Behavior Therapy (REBT) with brain-damaged individuals is discussed. The manuscript highlights the cognitive limitations of brain-injured individuals and the necessary adjustments required to develop more effective forms of cognitive psychotherapeutic intervention.

- E4 Laatsch, L., Little, D., & Thulborn, K. (2004). Changes in fMRI following cognitive rehabilitation in severe traumatic brain injury: A case study. *Rehabilitation Psychology*, 49(3), 262-267.
doi:<http://dx.doi.org/10.1037/0090-5550.49.3.262>**

ABSTRACT: Objective: To illustrate the relationship between changes in neuropsychological testing and changes in functional magnetic resonance imaging (fMRI) before and after cognitive rehabilitation therapy (CRT). Study Design: Single case study. Setting: Outpatient treatment center. Participant: A woman with history of severe

traumatic brain injury (TBI) 16 years before study. Intervention: Individualized CRT using a developmental metacognitive model. Main Outcome Measures: Neuropsychological tests and fMRI imaging performed during an eye movement task and a reading comprehension task. Results: Improvements on some neuropsychological test scores (>1 SD) and changes in the magnitude and distribution of the blood oxygen level dependent (BOLD) response as a function of task performance on both fMRI tasks. Conclusions: Individuals with severe TBI many years postinjury can demonstrate improvements in neuropsychological testing following CRT. Behavioral improvements can be related to changes in brain activity using fMRI.

- E5 Lebowitz, M. S., Dams-O'Connor, K., & Cantor, J. B. (2012). Feasibility of computerized brain plasticity-based cognitive training after traumatic brain injury. *Journal Of Rehabilitation Research & Development, 49*(10), 1547-1556 10p. doi:JRRD/2011.07.0133**

ABSTRACT: The present study investigates the feasibility and utility of using a computerized brain plasticity-based cognitive training (BPCT) program as an intervention for community-dwelling individuals with traumatic brain injury (TBI). In a pre-post pilot study, 10 individuals with mild to severe TBI who were 6 mo to 22 yr post injury were asked to use a computerized BPCT intervention—designed to improve cognitive functioning through a graduated series of structured exercises—at their homes in an urban community. Outcome measures included objective neuropsychological and self-report measures of cognitive functioning. All participants were able to use the software in their homes. Some mild fatigue was reported, which tended to dissipate over time. Few technical difficulties were reported. Remote support was sufficient for what technical assistance was needed. Participants reported subjective improvement in cognitive functioning, and small to large effect sizes on self-report and neuropsychological measures are reported. We conclude that BPCT may be a viable intervention for TBI outpatients as an adjunct to comprehensive neuro-rehabilitation. The intervention can be delivered in patients' homes with support provided remotely. Results of this study demonstrate the potential for treatment-related improvements many years after injury. Further study in controlled trials is warranted.

- E6 Ludlow, C. L., Hoit, J., Kent, R., Ramig, L. O., Shrivastav, R., Strand, E., & ... Sapienza, C. M. (2008). Translating Principles of Neural Plasticity Into Research on Speech Motor Control Recovery and Rehabilitation. *Journal Of Speech, Language & Hearing Research, 51*(1), S240-S258.**

ABSTRACT: To review the principles of neural plasticity and make recommendations for research on the neural bases for rehabilitation of neurogenic speech disorders. Method: A working group in speech motor control and disorders developed this report, which examines the potential relevance of basic research on the brain mechanisms involved in neural plasticity and discusses possible similarities and differences for application to speech motor control disorders. The possible involvement of neural plasticity in changes in speech production in normalcy, development, aging, and neurological diseases and disorders was considered. This report focuses on the appropriate use of functional and structural neuroimaging and the design of feasibility studies aimed at understanding how brain mechanisms are altered by environmental manipulations such as training and stimulation and how these changes might enhance the future development of rehabilitative methods for persons with speech motor control disorders. Conclusions: Increased collaboration with neuroscientists working in clinical research centers addressing human communication disorders might foster research in this area. It is hoped that this article will encourage future research on speech motor control disorders to address the principles of neural plasticity and their application for rehabilitation.

- E7 Milioni, A. L. V., Rodrigues, P. A., & Cunha, P. J. (2014). COGNITIVE FUNCTIONING, DECISION MAKING AND PREFRONTAL CORTEX DAMAGE: CONSEQUENCES, REHABILITATION AND NEURAL PLASTICITY. *Cognitive Sciences, 9*(2), 151-178. Retrieved from <http://search.proquest.com/docview/1655248269?accountid=35812>**

ABSTRACT: Traumatic brain injury (TBI) is a major problem of public health around the world. TBI is a neurological disorder that results in temporary or permanent changes in motor, cognitive and behavioral areas. It is one of the most common kinds of brain injuries in childhood/adolescence, a period in which the prefrontal cortex is in a developing process. The aim of this article is to review the neuropsychological consequences of TBI in the prefrontal cortex, as well as the valid strategies to be adopted that might contribute to a shorter recovery time of the patients. The TBI in the prefrontal cortex does not necessarily involve motor or sensorial deficits. However, it may cause functional, decision making, and social and academic impairments. More than a half of these patients develop a psychiatric disorder with disinhibiting symptoms and inappropriate behavior. Motivational, emotional, attention, perceptive and cognitive functions are mediated by the connections between the prefrontal cortex and the motor areas, the limbic system, the reticular system and the posterior association cortex. Generally, patients with TBI will present cognitive deficits associated with executive functions, decision making, problem-solving skills, judgment, and impulse control. The consequences of brain injury depend on a variety of factors, such as: the type of brain injury, intensity of the damage, extension, localization, environmental factors, age in which the TBI occurs, premorbid intelligence/cognitive reserve, and stage of cognitive development. For example, dorsolateral lesions have been associated with perseverative behavior, lack of initiative, deficit in ability to sustain and shift attention between stimuli or concepts, problem solving and working memory ("cold" executive functions). It is commonly confused with unmotivated behavior. On the other hand, ventromedial injuries have been associated with conducts based on emotional and social variables, such as inability to respond appropriately to social cues, failure to obey conventional social rules, inhibitory deficits, impulsivity and impaired decision making ("hot" executive functions). Right after the brain injury, new mechanisms of repair and reorganization of the Central Nervous System (CNS) emerge for an indefinite time period, aiming to reduce and compensate the functional impairment associated with the problem. A new neuronal circuit in the neighbor areas of the brain is established to recover lost functions and consequently to help the accomplishment of activities. The process of restructuring the brain and strengthening the cognitive functions is called neural plasticity and it can improve the prognostic of the subject at any stage of development or adult life. In most patients, when the brain injury in the prefrontal cortex happens, special educational needs or changes in the educational environment are necessary. In the meantime, there are promising treatments with stimulant drugs, neuropsychological rehabilitation, and cognitive behavioral therapy strategies. Further studies on neuropsychological rehabilitation are required to define to what extent individuals affected by TBI may have a restoration of premorbid cognitive abilities by making use of these integrated techniques.

E8 Muñoz-Cespedes, J.M., Rios-Lago, M., Paul, N., & Maestu, F. (2005). Functional neuroimaging studies of cognitive recovery after acquired brain damage in adults. *Neuropsychology Review*, 15(4), 169-83. doi:<http://dx.doi.org/10.1007/s11065-005-9178-5>

ABSTRACT: The first two decades of cognitive neuroimaging research have provided a constant increase of the knowledge about the neural organization of cognitive processes. Many cognitive functions (e.g. working memory) can now be associated with particular neural structures, and ongoing research promises to clarify this picture further, providing a new mapping between cognitive and neural function. The main goal of this paper is to outline conceptual issues that are particularly important in the context of imaging changes in neural function through recovery process. This review focuses primarily on studies made in stroke and traumatic brain injury patients, but most of the issues raised here are also relevant to studies using other acquired brain damages. Finally, we summarize a set of methodological issues related to functional neuroimaging that are relevant for the study of neural plasticity and recovery after rehabilitation.

E9 Nordvik, J. E., Walle, K. M., Nyberg, C. K., Fjell, A. M., Walhovd, K. B., Westlye, L. T., & Tornas, S. (2014). Bridging the gap between clinical neuroscience and cognitive rehabilitation: the role of cognitive training, models of neuroplasticity and advanced neuroimaging in future brain injury rehabilitation. *Neurorehabilitation*, 34(1), 81-85. doi:10.3233/NRE-131017

ABSTRACT: Magnetic resonance imaging (MRI) has brought about advances in the fields of brain plasticity and lifespan brain change, that might be of special interest for cognitive rehabilitation research and, eventually, in clinical practice. Parallel, intensive cognitive training studies show promising results for the prospect of retraining

some of the impaired functioning following acquired brain injury. OBJECTIVES: However, cognitive training research is largely performed without concurrent assessments of brain structural change and reorganization, which could have addressed possible mechanisms of training-related neuroplasticity. METHODS: Criticism of cognitive training studies is often focused on lack of ecologically valid, daily-living assessments of treatment effect, and on whether the applied cognitive measures overlap too much with the training exercises. Yet, the present paper takes another point of view, where the relevance of recent MRI research of brain plasticity to the field of cognitive rehabilitation is examined. RESULTS: Arguably, treatment ought to be measured at the same level of the International Classification of Functioning, Disability and Health model, as it is targeting. In the case of cognitive training that will be the “body structure” and “body function” levels. CONCLUSIONS: MRI has shown promise to detect macro- and microstructural activity-related changes in the brain following intensive training.

- E10 Penner, I., PhD., Opwis, K., & Kappos, L. (2007). Relation between functional brain imaging, cognitive impairment and cognitive rehabilitation in patients with multiple sclerosis. *Journal of Neurology*, 254, II53-7. doi:<http://dx.doi.org/10.1007/s00415-007-2013-6>**

ABSTRACT: Cognitive impairment belongs to the core symptoms in MS affecting quality of life, self-esteem, and social as well as occupational functioning. Due to this high impact on patients' well-being efficient treatment concepts are required. Imaging studies on cognition have shown that functional reorganization takes place spontaneously to compensate for deficits. In mildly to moderately impaired patients these processes may support coping with emerging deficits. However, these compensatory processes seem to be limited as brain activation of cognitively severely impaired patients is characterized by decreased additional recruitment of brain regions. Cognitive rehabilitation concentrates on the question whether induction of brain plasticity is possible for both the support of the spontaneous processes and the initiation of new ones. Combining cognition, brain imaging and cognitive rehabilitation in MS, an intriguing question is whether fMRI can provide further insights into the mechanisms of induced plasticity and serve as objective outcome measures for efficient cognitive intervention.

- E11 Van't Hooft, I., Andersson, K., Bergman, B., Sejersen, T., Von Wendt, L., & Bartfai, A. (2007). Sustained favorable effects of cognitive training in children with acquired brain injuries. *Neurorehabilitation*, 22(2), 109-116**

ABSTRACT: The overall aim of the present study was to assess in greater detail the sustained effects of a broad-based cognitive training programme on the neuropsychological performance of children with acquired brain injury. In particular, the long term (6 months) effects on cognitive functions, as well as how various moderators (gender, age at the time of injury/diagnosis, time since injury/diagnosis, age at the training) might influence outcome were investigated. A group of 38 children, 9–16 years of age, with various types of acquired brain injury had earlier been randomly assigned into treatment and control groups. These two groups had first been assessed directly after completion of the training and were now reassessed 6 months later. The treatment group exhibited significantly more persistent improvements with respect to complex tasks of attention and memory in comparison to the control group. In contrast there were no differences on simple reaction time tests. We conclude that the long term effects on cognitive functions of this broad-based neuro-cognitive training is encouraging. These positive results should be further investigated in larger more specific diagnostic groups and in different settings.

FILE F-- Cognitive Training for ADHD

- F1 Alloway, T. P., Gathercole, S. E., & Elliott, J. (2010). Examining the link between working memory behaviour and academic attainment in children with ADHD. *Developmental Medicine and Child Neurology*, 52(7), 632-6. Retrieved from <http://search.proquest.com/docview/578498777?accountid=35812>**

ABSTRACT: The aim of the present study was to investigate whether behaviors typical of working memory problems are associated with poor academic attainment in those with attention-deficit-hyperactivity disorder

(ADHD), as well as a non-clinical group identified on the basis of working memory difficulties. Children clinically diagnosed with ADHD-combined (n=31; mean age 9y 7mo, SD 12mo; 27 males) were matched with 44 low working memory children (mean age 9y 4mo, SD 15mo; 32 males) and 10 healthy controls (mean age 10y, SD 12mo; 5 males). Working memory behaviour was measured using the Working Memory Rating Scale (WMRS) and academic attainment was assessed with standardized tests of literacy and numeracy. The majority of children considered by their teachers to have problematic behaviors performed poorly in literacy and numeracy. When the whole sample were split into two groups on the basis of their working memory behaviour (on the WMRS), the 'At Risk' group performed significantly worse in academic attainment. As children with ADHD and a non-clinical group exhibit classroom behaviour typical of working memory problems, early screening to prevent subsequent learning difficulties is important. The use of the WMRS allows educators to draw on their expertise in the classroom for early detection of children with working memory failures.

- F2** Beck, S. J., Hanson, C. A., Puffenberger, S. S., Benninger, K. L., & Benninger, W. B. (2010). A controlled trial of working memory training for children and adolescents with ADHD. *Journal Of Clinical Child And Adolescent Psychology: The Official Journal For The Society Of Clinical Child And Adolescent Psychology, American Psychological Association, Division 53*, 39(6), 825-836. doi:10.1080/15374416.2010.517162

ABSTRACT: This study assessed the efficacy of a 5-week, intensive working memory training program for 52 children and adolescents (ages 7-17) who had Attention-Deficit/Hyperactivity Disorder (ADHD) and other comorbid diagnoses. This study provided a treatment replication since the waitlist control group also completed training and was included in the follow-up data analyses. Parents and teachers completed paper-and-pencil measures of working memory, executive functioning, and ADHD symptoms at baseline, posttreatment, and 4-month follow-up. Parent ratings indicated that participants improved on inattention, overall number of ADHD symptoms, initiation, planning/organization, and working memory. Teacher ratings approached significance at posttreatment and at 4-month follow-up on and Initiate scale. Working memory training appears promising as an intervention in improving executive functioning and ADHD symptoms.

- F3** Chacko, A., Feirsen, N., Bedard, A., Marks, D., Uderman, J. Z., & Chimiklis, A. (2013). Cogmed Working Memory Training for youth with ADHD: a closer examination of efficacy utilizing evidence-based criteria. *Journal Of Clinical Child And Adolescent Psychology: The Official Journal For The Society Of Clinical Child And Adolescent Psychology, American Psychological Association, Division 53*, 42(6), 769-783. doi:10.1080/15374416.2013.787622

ABSTRACT: The current review applied the evidence-based treatment criteria espoused by the Society for Clinical Child and Adolescent Psychology (Silverman & Hinshaw, 2008) to specifically evaluate the short-term and longer term efficacy of Cogmed Working Memory Training (CWMT) as a treatment for youth with Attention-Deficit/Hyperactivity Disorder (ADHD). Utilizing a systematic literature search, 7 studies that employed the school-age version of CWMT were identified for this review. The data reviewed herein suggest mixed findings regarding the benefit of CWMT for youth with ADHD. Two randomized controlled studies have demonstrated that CWMT led to improvements in neuropsychological outcomes and parent-rated ADHD symptoms relative to waitlist control and placebo treatment conditions. Another study demonstrated effects of CWMT relative to a placebo condition on an analog observation of behavior during an academic task, although this study did not find an effect of CWMT on parent-rated ADHD. Finally, an additional study utilizing an active comparison control condition did not find incremental benefits of CWMT on parent- or teacher-rated ADHD. Critical issues in interpreting existing studies include lack of alignment between demonstrated outcomes and the hypothesized model of therapeutic benefit of CWMT, issues with equivalence of control conditions, and individual differences that may moderate treatment response. Collectively, the strengths and limitations of the studies reviewed suggest that CWMT is best defined as a Possibly Efficacious Treatment for youth with ADHD. We suggest future directions for research and conclude with clinical implications of our findings for the treatment of youth with ADHD.

- F4** Gray, S., Chaban, P., Martinussen, R., Goldberg, R., Gotlieb, H., Kronitz, R., & ... Tannock, R. (2012). Effects of a computerized working memory training program on working memory, attention, and academics in adolescents with severe LD and comorbid ADHD: a randomized controlled trial. *Journal Of Child Psychology & Psychiatry*, 53(12), 1277-1284. doi:10.1111/j.1469-7610.2012.02592.x

ABSTRACT: Youths with coexisting learning disabilities (LD) and attention deficit hyperactivity disorder (ADHD) are at risk for poor academic and social outcomes. The underlying cognitive deficits, such as poor working memory (WM), are not well targeted by current treatments for either LD or ADHD. Emerging evidence suggests that WM might be improved by intensive and adaptive computerized training, but it remains unclear whether this intervention would be effective for adolescents with severe LD and comorbid ADHD. Methods: A total of sixty 12- to 17-year olds with LD/ADHD (52 male, 8 female, IQ > 80) were randomized to one of two computerized intervention programs: working memory training (Cogmed RM) or math training (Academy of Math) and evaluated before and 3 weeks after completion. The criterion measures of WM included auditory-verbal and visual-spatial tasks. Near and far transfer measures included indices of cognitive and behavioral attention and academic achievement. Results: Adolescents in the WM training group showed greater improvements in a subset of WM criterion measures compared with those in the math-training group, but no training effects were observed on the near or far measures. Those who showed the most improvement on the WM training tasks at school were rated as less inattentive/hyperactive at home by parents. Conclusions: Results suggest that WM training may enhance some aspects of WM in youths with LD/ADHD, but further development of the training program is required to promote transfer effects to other domains of function.

- F5** Holmes, J., Gathercole, S. E., Place, M., Dunning, D. L., Hilton, K. A., & Elliott, J. G. (2010). Working memory deficits can be overcome: Impacts of training and medication on working memory in children with ADHD. *Applied Cognitive Psychology*, 24(6), 827-836. doi:10.1002/acp.1589

ABSTRACT: This study evaluated the impact of two interventions—a training program and stimulant medication—on working memory (WM) function in children with attention deficit hyperactivity disorder (ADHD). Twenty-five children aged between 8 and 11 years participated in training that taxed WM skills to the limit for a minimum of 20 days, and completed other assessments of WM and IQ before and after training, and with and without prescribed drug treatment. While medication significantly improved visuo-spatial memory performance, training led to substantial gains in all components of WM across untrained tasks. Training gains associated with the central executive persisted over a 6-month period. IQ scores were unaffected by either intervention. These findings indicate that the WM impairments in children with ADHD can be differentially ameliorated by training and by stimulant medication.

- F6** Hovik, K. T., Aarlien, A., Saunes, B., & Egeland, J. (2010). Effects of working memory training on medicated ADHD preadolescents (10–12 years). *European Child & Adolescent Psychiatry*, 19S73. doi:10.1007/s00787-010-0117-5

ABSTRACT: Objective: PC-based working memory (WM) training has shown improved cognitive performance and symptom reduction in unmedicated ADHD youth [2, 3]. The present study tests whether also medicated preadolescents profit from WM training and whether training effects transfer to math and reading abilities [1]. Method: Seventy 10–12-year-olds with ADHD are taking part in the ongoing study. All subjects receive treatment-as-usual and are randomly assigned to either 5-week PC training or control group. Testing/symptom ratings from teachers/parents are carried out pre/ post intervention and after 6 months. Results: Analysis of the first 33 cases completing first post-test showed no differential effect in the intervention group on any of the neuropsychological tests or teacher ratings. Parent ratings showed decrease in ADHD symptoms. Differential improvements were also registered for reading/math scores. Conclusion: Medication could have exhausted the possibility of additional training effect. Additionally, it is not clear whether the progress can be ascribed to the WM training or placebo.

Hopefully, data from the 6-month post-test will help clarify this issue. Preliminary hypotheses will be presented in the poster.

F7 Klingberg, T., Forssberg, H., & Westerberg, H. (2002). Training of working memory in children with ADHD. *Journal of Clinical And Experimental Neuropsychology*, 24(6), 781-791.

ABSTRACT: Working memory (WM) capacity is the ability to retain and manipulate information during a short period of time. This ability underlies complex reasoning and has generally been regarded as a fixed trait of the individual. Children with attention deficit hyperactivity disorder (ADHD) represent one group of subjects with a WM deficit, attributed to an impairment of the frontal lobe. In the present study, we used a new training paradigm with intensive and adaptive training of WM tasks and evaluated the effect of training with a double blind, placebo controlled design. Training significantly enhanced performance on the trained WM tasks. More importantly, the training significantly improved performance on a non-trained visuo-spatial WM task and on Raven's Progressive Matrices, which is a nonverbal complex reasoning task. In addition, motor activity ± as measured by the number of head movements during a computerized test ± was significantly reduced in the treatment group. A second experiment showed that similar training-induced improvements on cognitive tasks are also possible in young adults without ADHD. These results demonstrate that performance on WM tasks can be significantly improved by training, and that the training effect also generalizes to non-trained tasks requiring WM. Training improved performance on tasks related to prefrontal functioning and had also a significant effect on motor activity in children with ADHD. The results thus suggest that WM training potentially could be of clinical use for ameliorating the symptoms in ADHD.

**F8 Rutledge, K. J., van den Bos, W., McClure, S. M., & Schweitzer, J. B. (2012). Training cognition in ADHD: current findings, borrowed concepts, and future directions. *Neurotherapeutics: The Journal Of The American Society For Experimental Neurotherapeutics*, 9(3), 542-558.
doi:10.1007/s13311-012-0134-9**

ABSTRACT: With both its high prevalence and myriad of negative outcomes, Attention-Deficit/Hyperactivity Disorder (ADHD) demands a careful consideration of the efficacy of its treatment options. Although the benefits of medication have a robust empirical background, nonpharmaceutical interventions evoke particular interest, as they are often viewed more favorably by parents. This review pays special attention to the use of working memory and recent cognitive training attempts in ADHD, describing its cognitive, behavioral, and biological effects in relation to current neurological theory of the disorder. While these treatments have demonstrated positive effects on some measures, there are limitations, as studies have failed to demonstrate generalization to critical measures, such as teacher-rated classroom behaviors, and have provided limited but growing evidence of functionally significant improvements in behavior. There is also a clear lack of research on the effects of training on reward systems and self-control. These limitations may be addressed by broadening the scope and procedures of the training and incorporating research concepts from other fields of study. First, it is important to consider the developmental trajectories of brain regions in individuals with the disorder, as they may relate to the effectiveness of cognitive training. Notions from behavioral economics, including delay discounting and framing (i.e., context) manipulations that influence present orientation, also have applications in the study of cognitive training in ADHD. In considering these other domains, we may find new ways to conceptualize and enhance cognitive training in ADHD and, in turn, address current limitations of interventions that fall in this category.

F9 Shaughnessy, M. F., & Moore, T. L. (2014). An interview with Dr. Tracy Alloway about working memory. *North American Journal of Psychology*, 16(2), 285-296. Retrieved from <http://search.proquest.com/docview/1534958896?accountid=35812>

Tracy P. Alloway is a Professor of Psychology at the University of North Florida. Formerly she was the Director of the Center for Memory and Learning in the Lifespan at an institution in the United Kingdom. She has spent almost 15 years being part of cutting-edge research on the importance of working memory in education. In addition to

publishing scientific articles, she has also written numerous books for academics, educators and the general public on the importance of working memory. She developed the internationally recognized Alloway Working Memory Assessment. Working memory has become a key construct in the psychological and intellectual literature over the past few decades. In this interview, Dr. Alloway discusses some key issues and reviews her research in this realm.

- F10 Johnstone, S., Roodenrys, S., Blackman, R., Johnston, E., Loveday, K., Mantz, S., & Barratt, M. (2012). Neurocognitive training for children with and without ADHD. *ADHD*, 4, 11-23. doi: 10.1007/s12402-011-0069-8**

ABSTRACT: Using a randomised waitlist control design, the present study examined the effects of combined working memory and inhibitory control training, with and without passive attention monitoring via EEG, for children with and without AD/HD. One hundred and twenty-eight children (60 children with AD/HD, 68 without AD/HD) were randomly allocated to one of three training conditions (waitlist; working memory and inhibitory control with attention monitoring; working memory and inhibitory control without attention monitoring) and completed with pre- and post-training assessments of overt behaviour (from 2 sources), trained and untrained cognitive task performance, and resting EEG activity. The two active training conditions completed 25 sessions of training at home over a 4- 5-week period. Results showed significant improvements in overt behaviour for children with AD/HD in both training conditions compared to the waitlist condition as rated by a parent and other adult. Post-training improvements in the areas of spatial working memory, ignoring distracting stimuli, and sustained attention were reported for children with AD/HD. Children without AD/HD showed behavioural improvements after training. The improvements for both groups were maintained over the 6-week period following training. The passive attention monitoring via EEG had a minor effect on training outcomes. Overall, the results suggest that combined WM/IC training can result in improved behavioural control for children with and without ADHD.

- F11 Amonn, F., Frölich, J., Breuer, D., Banaschewski, T., & Doepfner, M. (2013). Evaluation of a computer-based neuropsychological training in children with Attention-Deficit Hyperactivity Disorder (ADHD). *Neurorehabilitation*, 32(3), 555-562. doi:10.3233/NRE-130877**

ABSTRACT: We report the effects of a computer-based neuropsychological training in children with Attention-Deficit Hyperactivity Disorder (ADHD). We hypothesized that a specific training focusing on attentional dysfunction would result in an improvement of inattention, observable in test performance, behavior and performance during experimental school lessons and in parent and teacher ratings of the related core symptom. **METHOD:** We chose a within-subject-control-design with a 4 week baseline period and subsequent 12 to 15 weekly training-sessions. 30 children (6 to 13 years old) with a diagnosis of ADHD (ICD 10: F 90.0) and no other comorbidities participated in the study. **RESULTS:** The training revealed significant improvement in training parameters of the neuropsychological training and in the symptoms of inattention and deportment as rated during experimental school lessons. However, generalization of training effects as measured by parent and teacher ratings was not detected. **CONCLUSIONS:** We conclude that neuropsychological training could be helpful as one adjunct module in the complex treatment of ADHD but to prove clinical value, similar training programs must focus more strongly on individually existing neuropsychological deficits. Training programs should be more intensive and should eventually be combined with home based training access.

FILE G-- Cognitive Training for Dyslexia

- G1 Blythe, J. M. (2006). Computer-Based Phonological Skills Training for Primary Students with Mild to Moderate Dyslexia--A Pilot Study. *Australian Journal Of Educational & Developmental Psychology*, 639-49.**

ABSTRACT: This pilot study investigated the efficacy of "Phonics Alive 2: The Sound Blender", a computer-based phonological skills training program, delivered with both at-home and at-school components over a 10-week

period, as a potential treatment of phonological dyslexia. Participants were 20 dyslexic primary students with an average delay of 13 months on a word reading task; 11 months on a reading comprehension task, and 25 months on a pseudoword decoding task. Results indicated significant main and interaction effects for the treatment group, particularly on reading comprehension and pseudoword decoding measures. Discussion of results includes the potential advantages of computer-based treatment programs that involve the home and school in cooperative ways.

G2 Das, J. P., Mishra, R. K., & Pool, J. E. (1995). An experiment on cognitive remediation of word-reading difficulty. *Journal Of Learning Disabilities*, 28(2), 66-79.

ABSTRACT: Cognitive remediation of decoding deficit was attempted by following a theoretically based program. The theory identifies four major cognitive processes: Planning, Attention, Simultaneous, and Successive (PASS) processing. The PASS Remedial Program (PREP) provides 10 structured tasks that are aimed at developing internalized strategies for mainly successive processes (6 tasks) and simultaneous process (4 tasks); deficits in either of the two may lead to poor decoding. Through its "global process" training and curriculum-related "bridging" training, PREP facilitates application of internalized strategies arrived at inductively for learning word decoding and spelling; it does not provide direct teaching of rules or exercises. To test the efficacy of PREP, we divided 51 children with decoding difficulties in Grade 4 into two groups: PREP (both global and bridging) and no treatment. In the second part of the study, children from the no-treatment group received either the global or the bridging part of PREP. The relative efficacy of training was tested by pre-, and posttests of performance on a standard word-decoding test (the WRMT-R), as well as on some cognitive tests (e.g., the CAS). The largest improvement in word decoding occurred for the PREP combined global and bridging treatment. The mechanism through which PREP improves word reading is discussed, as is PREP for children at risk of developing dyslexia.

**G3 Demonet, Jean-Francois, Taylor, M. J., & Chaix, Y. (2004). Developmental dyslexia. *The Lancet*, 363(9419), 1451-60. Retrieved from
<http://search.proquest.com/docview/198979169?accountid=35812>**

ABSTRACT: Developmental dyslexia, or specific reading disability, is a disorder in which children with normal intelligence and sensory abilities show learning deficits for reading. Substantial evidence has established its biological origin and the preponderance of phonological disorders even though important phenotypic variability and comorbidity have been recorded. Diverse theories have been proposed to account for the cognitive and neurological aspects of dyslexia. Findings of genetic studies show that different loci affect specific reading disability although a direct relation has not been established between symptoms and a given genomic locus. In both children and adults with dyslexia, results of neuroimaging studies suggest defective activity and abnormal connectivity between regions crucial for language functions--eg, the left fusiform gyrus for reading--and changes in brain activity associated with performance improvement after various remedial interventions.

**G4 Fawcett, A. J., & Nicolson, R. I. (2007). Dyslexia, learning, and pedagogical neuroscience. *Developmental Medicine and Child Neurology*, 49(4), 306-11. Retrieved from
<http://search.proquest.com/docview/195605557?accountid=35812>**

ABSTRACT: The explosion in neuroscientific knowledge has profound implications for education, and we advocate the establishment of the new discipline of 'pedagogical neuroscience' designed to combine psychological, medical, and educational perspectives. We propose that specific learning disabilities provide the crucible in which the discipline may be forged, illustrating the scope by consideration of developmental dyslexia. Current approaches have failed to establish consensus on fundamental issues such as theoretical causes, diagnostic methods, and treatment strategies. We argue that these difficulties arise from diagnosis via behavioural or cognitive symptoms, even though they may arise from diverse causes. Rather than an inconvenience, variability of secondary symptoms within and across learning disabilities can inform both diagnosis and treatment. We illustrate how brain-based theories lead to radical restructuring of diagnostic methods and propose that there is an urgent need to develop genetic and brain-based diagnostic methods designed to lead to individually-appropriate remediation and treatment.

- G5 Kast, M., Baschera, G., Gross, M., Jancke, L., & Meyer, M. (2011). Computer-Based Learning of Spelling Skills in Children with and without Dyslexia. *Annals of Dyslexia*, 61(2), 177-200.**

ABSTRACT: Our spelling training software recodes words into multisensory representations comprising visual and auditory codes. These codes represent information about letters and syllables of a word. An enhanced version, developed for this study, contains an additional phonological code and an improved word selection controller relying on a phoneme-based student model. We investigated the spelling behavior of children by means of learning curves based on log-file data of the previous and the enhanced software version. First, we compared the learning progress of children with dyslexia working either with the previous software ($n = 28$) or the adapted version ($n = 37$). Second, we investigated the spelling behavior of children with dyslexia ($n = 37$) and matched children without dyslexia ($n = 25$). To gain deeper insight into which factors are relevant for acquiring spelling skills, we analyzed the influence of cognitive abilities, such as attention functions and verbal memory skills, on the learning behavior. All investigations of the learning process are based on learning curve analyses of the collected log-file data. The results evidenced that those children with dyslexia benefit significantly from the additional phonological cue and the corresponding phoneme-based student model. Actually, children with dyslexia improve their spelling skills to the same extent as children without dyslexia and were able to memorize phoneme to grapheme correspondence when given the correct support and adequate training. In addition, children with low attention functions benefit from the structured learning environment. Generally, our data showed that memory sources are supportive cognitive functions for acquiring spelling skills and for using the information cues of a multi-modal learning environment.

- G6 Victor H P van, D., & Reitsma, P. (1999). Effects of outpatient treatment of dyslexia. *Journal of Learning Disabilities*, 32(5), 447-56. Retrieved from
<http://search.proquest.com/docview/194225785?accountid=35812>**

ABSTRACT: The effects of a Dutch intervention program for dyslexia are reported. The program was individually tailored, depending on the style of reading, the phase of the learning process, and the intermediate results of the treatment. Two groups of participants were involved: (a) a group of children with pure dyslexia ($n = 109$) and (b) a group that had reading problems but also suffered from cognitive deficits or psychiatric symptoms ($n = 29$). Scores of reading single words and text at intake and after the intervention were analyzed to assess the efficacy of the intervention program. Furthermore, the effects of pre-intervention variables such as intelligence, reported speech, and language problems and of intervention variables such as the initial level of performance and the duration of the treatment were examined. Both groups benefitted from the intervention, but the children with pure dyslexia profited most. Neither of the groups could catch up the reading deficit. Intelligence and reported speech and language problems did not affect the treatment outcomes. Individual differences in treatment outcome were related to the absolute level of word reading and age at intake. In the group with comorbidity, the intervention program was more successful in relatively younger children. Within this group, the cognitive deficits and types of psychiatric problems were not related to the treatment.

- G7 Kraus, D., & Horowitz-Kraus, T. (2014). The effect of learning on feedback-related potentials in adolescents with dyslexia: An EEG-ERP study. *PLoS One*, 9(6)
doi:<http://dx.doi.org/10.1371/journal.pone.0100486>**

ABSTRACT: Individuals with dyslexia exhibit associated learning deficits and impaired executive functions. The Wisconsin Card Sorting Test (WCST) is a learning-based task that relies heavily on executive functioning, in particular, attention shift and working memory. Performance during early and late phases of a series within the task represents learning and implementation of a newly learned rule. Here, we aimed to examine two event-related potentials associated with learning, feedback-related negativity (FRN)-P300 complex, in individuals with dyslexia performing the WCST. Methods -Adolescents with dyslexia and age-matched typical readers performed the Madrid card sorting test (MCST), a computerized version of the WCST. Task performance, reading measures, and cognitive measures were collected. FRN and the P300 complex were acquired using the event-related potentials

methodology and were compared in early vs late errors within a series. Results -While performing the MCST, both groups showed a significant reduction in average reaction times and a trend toward decreased error rates. Typical readers performed consistently better than individuals with dyslexia. FRN amplitudes in early phases were significantly smaller in dyslexic readers, but were essentially equivalent to typical readers in the late phase. P300 amplitudes were initially smaller among readers with dyslexia and tended to decrease further in late phases. Differences in FRN amplitudes for early vs late phases were positively correlated with those of P300 amplitudes in the entire sample. Conclusion -Individuals with dyslexia demonstrate a behavioral and electrophysiological change within single series of the MCST. However, learning patterns seem to differ between individuals with dyslexia and typical readers. We attribute these differences to the lower baseline performance of individuals with dyslexia. We suggest that these changes represent a fast compensatory mechanism, demonstrating the importance of learning strategies on reading among individuals with dyslexia.

- G8 Eliasi, A., & Razaqi, T. (2013). COGNITIVE NEUROPSYCHOLOGICAL PROCESSES, LANGUAGE LEARNING DISORDERS AND TASK-INTEGRATED PAIR READING: EVIDENCE FROM DYSLEXIC EFL LEARNERS' WORD DECODING IMPAIRMENT. *Modern Journal of Language Teaching Methods*, 3(4), 98-106. Retrieved from <http://search.proquest.com/docview/1511020399?accountid=35812>**

ABSTRACT: The present classroom-based quasi-experimental study has a shot at exploring and outlining developmental cognitive disorders in dyslexic EFL learners. The study follows a two-group pretest, treatment, post-test design and focuses on the different ways in which task-integrated partner reading activities are presented to dyslexic learners. The study documented 30 low-intermediate dyslexic Iranian EFL learners with the same proficiency level measured by an OPT test. The participants were randomly assigned to an experimental and a control group that were exposed to task-integrated partner reading activities and traditional instruction respectively. Analysis of the data obtained from independent-samples t-test indicated that the participants of the experimental group improved in the four tested areas, and that there were significant quantitative and statistical differences in the output of participants from the two different groups, with learners who participated in the experimental group outperforming and incorporating significantly better reading skills in the posttest than learners from the control group.

- G9 Krafnick, A. J., Flowers, D. L., Napoliello, E. M., & Eden, G. F. (2011). Gray matter volume changes following reading intervention in dyslexic children. *NeuroImage*, 57(3), 733-741. doi:<http://dx.doi.org/10.1016/j.neuroimage.2010.10.062>**

ABSTRACT: Studies in children and adults with the reading disability developmental dyslexia have shown behavioral improvements after reading intervention. In another line of work, it has been shown that intensive training in a variety of cognitive and sensorimotor skills can result in changes in gray matter volume (GMV). This study examined changes in GMV following intensive reading intervention in children with dyslexia using voxel-based morphometry (VBM). Eleven dyslexic children underwent an eight week training focused on mental imagery, articulation and tracing of letters, groups of letters and words, which resulted in significant gains in reading skills. This was followed by an eight week null period (control) where no intervention was administered and no further significant gains in reading were observed. Structural scans were obtained before the intervention, after the intervention and after the null period. GMV increases between the first two time points were found in the left anterior fusiform gyrus/hippocampus, left precuneus, right hippocampus and right anterior cerebellum. However these areas did not change between time points two and three (control period), suggesting that the changes were specific to the intervention period. These results demonstrate for the first time that (1) training-induced changes in GMV can be observed in a pediatric sample and (2) reading improvements induced by intervention are accompanied by GMV changes.

- G10 Moura, O., Simões, M. R., & Pereira, M. (2014). WISC-III Cognitive Profiles in Children with Developmental Dyslexia: Specific Cognitive Disability and Diagnostic Utility. *Dyslexia* (10769242), 20(1), 19-37. doi:10.1002/dys.1468**

ABSTRACT: This study analysed the usefulness of the Wechsler Intelligence Scale for Children-Third Edition in identifying specific cognitive impairments that are linked to developmental dyslexia (DD) and the diagnostic utility of the most common profiles in a sample of 100 Portuguese children (50 dyslexic and 50 normal readers) between the ages of 8 and 12 years. Children with DD exhibited significantly lower scores in the Verbal Comprehension Index (except the Vocabulary subtest), Freedom from Distractibility Index (FDI) and Processing Speed Index subtests, with larger effect sizes than normal readers in Information, Arithmetic and Digit Span. The Verbal-Performance IQs discrepancies, Bannatyne pattern and the presence of FDI; Arithmetic, Coding, Information and Digit Span subtests (ACID) and Symbol Search, Coding, Arithmetic and Digit Span subtests (SCAD) profiles (full or partial) in the lowest subtests revealed a low diagnostic utility. However, the receiver operating characteristic curve and the optimal cut-off score analyses of the composite ACID; FDI and SCAD profiles scores showed moderate accuracy in correctly discriminating dyslexic readers from normal ones. These results suggested that in the context of a comprehensive assessment, the Wechsler Intelligence Scale for Children-Third Edition provides some useful information about the presence of specific cognitive disabilities in DD. Copyright © 2013 John Wiley & Sons, Ltd. Practitioner Points Children with developmental dyslexia revealed significant deficits in the Wechsler Intelligence Scale for Children-Third Edition subtests that rely on verbal abilities, processing speed and working memory, The composite Arithmetic, Coding, Information and Digit Span subtests (ACID); Freedom from Distractibility Index and Symbol Search, Coding, Arithmetic and Digit Span subtests (SCAD) profile scores showed moderate accuracy in correctly discriminating dyslexics from normal readers., Wechsler Intelligence Scale for Children-Third Edition may provide some useful information about the presence of specific cognitive disabilities in developmental dyslexia.

FILE H-- 1on 1 Cognitive Training Vs Tutoring

- H1 Eisenberg, T., Fresko, B., & Carmeli, M. (n.d.). An Assessment of Cognitive Changes in Socially Disadvantaged Children as a Result of a One-to-One Tutoring Program. *Journal Of Educational Research*, 74(5),**

ABSTRACT: Socially disadvantaged children who were tutored on a one-to-one basis twice a week did not show any significant achievement gain over non-tutored children, although data from tutors, parents, children, and teachers indicate that the tutoring should have had an impact

- H2 Leh, J. M., & Jitendra, A. K. (2013). Effects of Computer-Mediated versus Teacher-Mediated Instruction on the Mathematical Word Problem-Solving Performance of Third-Grade Students with Mathematical Difficulties. *Learning Disability Quarterly*, 36(2), 68-79.**

ABSTRACT: This study compared the effectiveness of computer-mediated instruction (CMI) and teacher-mediated instruction (TMI) on the word problem-solving performance of students struggling in mathematics. Both conditions integrated cognitive modeling that focused on the problem structure using visual representations with critical instructional elements specifically targeting the needs of at-risk students. Participants were 25 third-grade students with mathematics difficulties who were randomly assigned to either a TMI or a CMI condition. Results indicated no statistically significant between-condition differences at posttest and on a 4-week retention test of word problem solving. Furthermore, there was no transfer of the word problem-solving skills to a school administered, standardized mathematics achievement test. Implications for educational practice are discussed.

- H3 Peretz, C., Korczyn, A. D., Shatil, E., Aharonson, V., Birnboim, S., & Giladi, N. (2011). Computer-based, personalized cognitive training versus classical computer games: A randomized**

double-blind prospective trial of cognitive stimulation. *Neuroepidemiology*, 36(2), 91-9.
doi:<http://dx.doi.org/10.1159/000323950>

ABSTRACT: Many studies have suggested that cognitive training can result in cognitive gains in healthy older adults. We investigated whether personalized computerized cognitive training provides greater benefits than those obtained by playing conventional computer games. Methods: This was a randomized double-blind interventional study. Self-referred healthy older adults ($n = 155$, 68.8 years old) were assigned to either a personalized, computerized cognitive training or to a computer games group. Cognitive performance was assessed at baseline and after 3 months by a neuropsychological assessment battery. Differences in cognitive performance scores between and within groups were evaluated using mixed effects models in 2 approaches: adherence only (AO; $n = 121$) and intention to treat (ITT; $n = 155$). Results: Both groups improved in cognitive performance. The improvement in the personalized cognitive training group was significant ($p < 0.03$, AO and ITT approaches) in all 8 cognitive domains. However, in the computer games group it was significant ($p > 0.05$) in only 4 (AO) or 6 domains (ITT). In the AO analysis, personalized cognitive training was significantly more effective than playing games in improving visuospatial working memory ($p = 0.0001$), visuospatial learning ($p = 0.0012$) and focused attention ($p = 0.0019$). Conclusions: Personalized, computerized cognitive training appears to be more effective than computer games in improving cognitive performance in healthy older adults. Further studies are needed to evaluate the ecological validity of these findings.

H4 Price, L., Richardson, J. E., & Jelfs, A. (2007). Face-to-Face versus Online Tutoring Support in Distance Education. *Studies In Higher Education*, 32(1), 1-20.

ABSTRACT: The experiences of students taking the same course by distance learning were compared when tutorial support was provided conventionally (using limited face-to-face sessions with some contact by telephone and email) or online (using a combination of computer-mediated conferencing and email). Study 1 was a quantitative survey using an adapted version of the Course Experience Questionnaire and the Revised Approaches to Studying Inventory. Study 2 was another quantitative survey using the Academic Engagement Form. Study 3 was an interview-based examination of the students' conceptions of tutoring and tuition. In all three studies, the students receiving online tuition reported poorer experiences than those receiving face-to-face tuition. Study 3 showed that tutoring was seen not only as an academic activity but also as a highly valued pastoral activity. To make online tuition successful both tutors and students need training in how to communicate online in the absence of paralinguistic cues.

H5 Richardson, J. E. (2009). Face-to-face versus online tutoring support in business studies courses in distance education. *International Journal Of Management Education (Oxford Brookes University)*, 7(3), 1-11. doi:10.3794/ijme.73.241

ABSTRACT: Research has suggested that distance-learning students may rate their tuition less favourably when it is provided online rather than face-to-face. The experiences of students taking business studies courses by distance education were compared when tutorial support was provided conventionally (using limited face-to-face sessions with some contact by telephone and email) or online (using both computer-mediated conferencing and email). The Course Experience - Questionnaire and the Revised Approaches to Studying Inventory were administered in a postal survey to students taking one of three business studies courses with the Open University. The students who received online tuition rated their workload as more appropriate. Otherwise, there were no significant differences between the students who received face-to-face tuition and those who received online tuition, either in their perceptions of the academic quality of their courses or in the approaches to studying that they adopted. Provided that tutors and students receive appropriate training and support, course designers in business studies can be confident about introducing online forms of tutorial support in campus-based or distance education.

- H6 Siler, S. A., & VanLehn, K. (2009). Learning, Interactional, and Motivational Outcomes in One-to-One Synchronous Computer-Mediated versus Face-to-Face Tutoring. *International Journal Of Artificial Intelligence In Education*, 19(1), 73-102.**

ABSTRACT: Face-to-face (FTF) human-human tutoring has ranked among the most effective forms of instruction. However, because computer-mediated (CM) tutoring is becoming increasingly common, it is instructive to evaluate its effectiveness relative to face-to-face tutoring. Does the lack of spoken, face-to-face interaction affect learning gains and motivation? In this study, pairs of undergraduate students and tutors worked on physics problems either face-to-face or via a typed chat window. Although face-to-face tutoring took less time, students learned equal amounts in the two conditions. In both conditions, short tutor turns were associated with increased student learning. In both conditions, students who were more active had higher learning gains. Students in the CM condition who gained more produced more words per conversational turn. The same relationship was found in the FTF context only after back-channel feedback was taken out. A more direct measure of student activity, the relative proportion of student-initiated actions in problem-solving, was more strongly associated with student learning in the FTF context, but only for students with higher verbal SAT scores. Of the motivational variables we investigated, only students' ability goals (i.e. wanting to demonstrate one's ability to others) were influenced somewhat differently by the two contexts. These results suggest that although the difference in communication medium changes superficial characteristics of the tutoring such as its duration, most of the important pedagogical characteristics – learning gains, tutorial interaction, the activity measures associated with learning gains, and student motivation – were not affected.