DOWNLOAD PDF II. THE MEASUREMENT OF PITCH DISCRIMINATION [BY C. E. SEASHORE.

Chapter 1 : Judy Duchan's History of Speech - Language Pathology

TH E MEASUREMEN T OF PITCH DISCRIMINATION: A PRELIMINARY REPORT. B y C. E. Seashore. Thi s report was called for by the Association in the belief.

Audio Signal Classification by David Gerhard , " Audio signal classification [ASC] consists of extracting relevant features from a sound, and of using these features to identify into which of a set of classes the sound is most likely to fit. The feature extraction and grouping algorithms used can be quite diverse depending on the classification do The feature extraction and grouping algorithms used can be quite diverse depending on the classification domain of the application. This paper presents background necessary to understand the general research domain of ASC, including signal processing, spectral analysis, psychoacoustics and auditory scene analysis. Audio signal classification ASC consists of extracting relevant features from a sound, and of using these features to identify into which of a set of classes the sound is most likely to fit. Also presented are the basic elements To investigate the perceptual differences between talking and singing, human subjects were exposed to a corpus of singing and talking sounds, and asked first to classify each sound on a scale between speaking and singing, and then to indicate the characteristics of the sounds that lead t To investigate the perceptual differences between talking and singing, human subjects were exposed to a corpus of singing and talking sounds, and asked first to classify each sound on a scale between speaking and singing, and then to indicate the characteristics of the sounds that lead to their judgements. The subject responses indicated that pitch is a primary factor in making this judgement. Other features not directly related to pitch include rhythm, rhyme, context and expectation. As will be seen later in this paper, some of these features can also be investigated using pitch as a base feature Show Context Citation Context Vibrato is not present in all sung utterances, but it is present in very few spoken utterances. Vibrato indicators are extracted from the f0 track using tw Maher, Aes Member " Vibrato, the natural oscillation of musical pitch that is commonly associated with music performed by skilled singers and instrumentalists in certain musical styles, is an important aspect of realistic music synthesis. For synthesized singing particular care must be taken to ensure that the synthesi For synthesized singing particular care must be taken to ensure that the synthesized vibrato behaves naturally, especially in the vicinity of portamento Show Context Citation Context A good vibrato is a pulsation of pitch, usually accompanied with synchronous pulsations of loudness and timbre, of such extent and rate as to give a pleasing flexibility, tenderness, and richness to Commercially available CD records were used to insure that the vibrato originated in a real musical performance. It was found, that the vibrato rate typically increased at the end of each tone, while It was found, that the vibrato rate typically increased at the end of each tone, while no typical structure could be found in the beginning of a tone.

Chapter 2 : The Interplay between Musical and Linguistic Aptitudes: A Review

Carl Seashore Carl Emil Seashore, born SjÃ¶strand (January 28, - October 16,), was a prominent American psychologist and educator. He was the author of numerous books and articles principally regarding the fields of speech-language pathology, music education, and the psychology of music and art.

He emigrated with his family to the United States in at the age of 3 due to both economic and religious considerations and settled in Rockford, Iowa , before moving and settling in a farming community located in Boone County, Iowa. Seashore had two sisters and two brothers who were all educated in Swedish. His father, Carl Gustav Seashore, was a lay preacher and built a church, where Seashore began serving as the church organist at the age of He graduated from Gustavus Adolphus College in St. Peter, Minnesota , in , having studied mathematics, music, classical languages and literature. Music was considered the "most important extracurricular activity in college" and he enjoyed singing at all sorts of collegiate occasions. During his years in college he served as the organist and choir director of a local Swedish-American Lutheran church and his salary there paid most of his college expenses. He studied under George Trumbull Ladd , professor of metaphysics and moral philosophy , and Edward Wheeler Scripture , an experimental psychologist who conducted research on phonetics. D in psychology for his dissertation on the role of inhibition in learning. D degree from Yale, Seashore spent the summer in Europe to visit different German and French psychology laboratories before returning to Yale University as a Fellow in Psychology and an assistant to Ladd. In , he was offered a permanent position at Yale. Additionally, he was also offered an opportunity to go to China as a missionary teacher. However, he decided to return to his home state and spent the next fifty years as a researcher and an assistant professor of psychology at the University of Iowa. He became president of the American Psychological Association in and presided over the 20th meeting in Washington D. He also served as Chairman of the Division of Anthropology and Psychology from - In particular, he was interested in the three perspectives of the psychology of music: He devised the Seashore Tests of Musical Ability in , a version of which is still used in schools in the United States. During the early s, he received financial support for his research from the Bell Laboratories. Among the larger projects that he supervised was one at the Eastman School of Music with financial assistance from George Eastman. His complete publication list from to includes books and articles. He strived to incorporate experimental psychology and the scientific method into the fields of art and related subjects. There, he also mentored several students that eventually became prominent psychological figures, such as Walter Richard Miles , Francis P. The Use of Vibrato in Music[edit] Seashore dedicated some of his musical focus on understanding the perception of vibrato , or the pulsation of pitch, in music and its effects on the richness and vibrance of tone. He spent considerable time to measure, record, and define the function of vibrato in music. He described vibrato as "a basic phenomenon of nature" to provide the tone with richness and emotion. Seashore proposed using devices and measuring instruments to record musical patterns and analyze the frequency, pulsation, and occurrence of vibrato in music. He insisted that "musical talent is subject to scientific analysis and can be measured. While creating the different tests of musical talents, he made sure that the tests were: Seashore recommended that the test should first be administered to children in the fifth grade and again in the eighth grade before children enter into elective courses in high school. Hearing two tones and determining which one is higher. Hearing two tones of different loudness and determining which one is stronger. Hearing three clicks marking two intervals of time and determining which interval is longer. Hearing two combinations of two tones and determining which one sounds better harmony. Hearing a series of tones twice with the second playing having an adjusted note and identifying which note was changed. Additional subtests were incorporated to measure other features of musical perception, including timbre , rhythm , musical memory, and emotional reactions and self-expressions in music. Each test would be normed and given a percentage value; the results would then be shown in a single graph or curve and would help convey an immediate representation of the features of musical traits or capacities of a specific individual. Another aim of the battery was to identify musically talented students and to encourage them to pursue music. The inventory also serves to objectify the elements of musical appreciation and to shape the science, psychology, and art of music. Norman Charles Meier, who eventually became an associate professor in the psychology department. In , Seashore and Meier published the Meier-Seashore Art Judgment Test, where subjects were asked to select the "better more pleasing, more artistic, more satisfying " from two pictures. Meier independently went on to develop the Meier Art Tests I: Art Judgment in and the Meier Art Tests: Aesthetic Perception in as successors of the Meier-Seashore Art Judgment Test and to continue measuring different dimensions of artistic aptitude. The publications focused on research methods, nutrition, physical growth, mental growth, child behavior, pre-school education, parent education, and mental hygiene. Seashore spent the majority of his professional life at the University of Iowa, where he held the position of Dean of the Graduate School for 28 years. He retired in at the age of 70 but was recalled as Dean Pro Tempore of the Graduate School in After four years, he finally retired for the second time in at the age of

Chapter 3 : Carl Seashore - Wikipedia

Committee on the Standardizing of Procedure in Experimental Tests.] The measurement of pitch discrimination [by] C.E. Seashore. of pitch discrimination [by] C.

Kendall Professor of Psychology In the office area of the psychology department there is a bust of Carl Emil Seashore, an graduate of Gustavus. Widely recognized as one of the early leaders in psychology in America, Dr. Seashore spent most of his professional life at the University of Iowa. He was a member of the faculty at Iowa from until his retirement in In addition to his duties as professor and chairman of his department, he was made Dean of the Graduate School, University of Iowa, in and held that position concurrently with his other duties for 28 years. He retired in at the age of seventy but was recalled as Dean Pro Tempore of the Graduate School in and finally retired for the second time in at the age of Most people who recognize his name today associate it with the Seashore Tests of Musical Ability which are still widely used. He was a man of wide ranging abilities and achievements and certainly one of the outstanding alumni of Gustavus. The surname Seashore is a direct translation of Sjostrand, and was the name adopted by an uncle when he came to the United States and was subsequently adopted by each branch of the family as they immigrated. In addition, Carl Gustav had acquired skills as a carpenter. The father was also a lay preacher. Although reasonably well off in Sweden by the standards of the time, the family elected to immigrate to the United States in when Carl Emil was three years old. Although the motives for this move are not explicitly stated in Dr. After a six-week journey across the Atlantic, the family arrived in the United States. A brief stay in Rockford, Illinois, was followed by a move to Boone County, Iowa, where an uncle, Alfred Seashore, had homesteaded a few years earlier. The family located an eighty acre farm and almost immediately built a house. Thus Carl Emil Seashore began his life as an Iowa farm boy. Carl Seashore was educated in his home until the age of eight when a district school house was built. Although it was well before the time of J. Seashore reports "My parents taught me to read Swedish. Their first and only trick lay in using a primer which had a picture of a rooster at the back of the book. Every day I had done my lesson well, the magic rooster would lay a penny the following night. I can at this moment feel myself hanging in the balance between feelings of fact and fancy as to the mechanism and reality of this process. Of his years in the district school, he wrote: From age eight to age sixteen I probably attended the public school less than six hundred days in all. Of his admission at Gustavus at the age of eighteen, Seashore writes, "I entered the second year of the three-year academy on a fluke, the fluke being that they examined me mainly in mathematics, English and history, and the examinations were based on the books I had studied. These books I knew. Of other subjects I knew practically nothing. As Seashore himself has written: He had gone to Gustavus Adolphus College, St. Peter, Minnesota, so there I went. The religious and ethnic character of the college was consistent with his own background and experience. He followed the only course of study available, a classical one. He especially enjoyed mathematics and Greek, and music played an important role. In speaking about his academic interests during his undergraduate years, Seashore expressed particular appreciation for two of his professors , Dr. Jacob Uhler and the president of the college, Dr. Each new phase of the subject was a challenge which invited attack. It was exact, it had a system, it rewarded logic and effort. Besides that, it was the best-taught subject in the college, primarily because it was taught by Professor Uhler, our most beloved professor. Greek grammar enlisted almost the same appeal as mathematics. Greek literature opened a new world of appreciation for me. Music was especially important, and Seashore speaks most fondly of his own participation. He points out that, for him at least, music was the most important extracurricular activity in the college. In this life of song in college, I had some degree of leadership and found in it my sweetest pleasures. With us it became an intramural competitive sport. We were invited to sing, expected to sing, and loved to sing at all sorts of occasions. Yet our chief pleasure came from self-expression among ourselves quite apart from audiences. During his years in college he served as the organist and choir director of the "Swedish-Lutheran" church in Mankato and his salary there paid most of his college expenses. Carl Emil Seashore graduated from Gustavus in , there were a total of sixty graduate students at the university. The graduate students knew each other well and apparently moved freely from one seminar to another. The day that Seashore entered Yale was also the day that the psychological laboratory was opened. Ladd, the leading figure in psychology at Yale, obviously took an interest in Carl Seashore. After four years of study under Ladd he completed his dissertation having done work on the role of inhibition in learning. Seashore was awarded the PhD from Yale in His was the first PhD awarded by Yale to a student in psychology. Seashore spent the summer in Europe visiting German and French laboratories, and other centers of psychology investigation. In the fall of he returned to Yale as a Fellow in Psychology which meant he served as an assistant to Ladd. In , Seashore made a significant decision. He had been offered a permanent position at Yale. He also was given the opportunity to go to China as a missionary teacher. However, he elected to return to his home state, accepting a position at the University of Iowa. He spent the remaining years of his life at the University of Iowa, a career which spanned nearly fifty years. The years at Iowa were most productive. A detailed account of his accomplishments would fill many volumes. Here, a few highlights will have to suffice. His first ten years were devoted almost entirely to his teaching and research. He was especially interested in audiology and in cooperation with the colleagues in physics developed one of the first audiometers. This device was made available on a commercial basis in In , Seashore had achieved the rank of full professor and was the chairman of the department of psychology. He had already achieved a substantial reputation as an experimental psychologist, primarily in the psychology of hearing. In , he was made Dean of the Graduate School, a position he held until his retirement in His first major activity as Dean was to visit many of the small colleges in Iowa and adjacent states, become acquainted with their faculties and encourage them to send their most able students to pursue graduate study at the University of Iowa. It is particularly noteworthy that during his twenty-nine years as a university administrator, he was able to continue an active career in both teaching and research. During much of this time he taught the introductory course in psychology, at times to as many as six hundred students. He continued his research in the area of musical abilities, publishing the first form of the Seashore Tests of Musical Ability in During his years as Dean, he managed to add citations to his list of publications. His complete publication lists from to includes books and articles. In his role as Dean of the Graduate School at the University of Iowa, he founded and shaped what was to become an outstanding speech and hearing department at the University of Iowa--one that was to establish a fledgling field of speech correction into a well respected scientifically-based profession of speech-language pathology. Seashore was born in in Morlunda, Sweden. His family name was Sjostrand, which means "seashore" in Swedish. The family had a small farm and his father was a lay preacher as well as a carpenter. They were insulated, religious, and were able to live comfortably off their farm. They joined a Swedish farming community in Boone County, Iowa. Carl lived on an 80 acre farm and in a house that was built by his father. Carl, his two sisters, and his two brothers were all educated at home in their early years. They spoke and read in Swedish, as did all of the members of his small Iowan community. At 8 years of age he began attending a district school, built and directed by his father. He graduated from this school at During his adolescence he worked on the farm and he taught young children in a nearby country school, as well as attended his own school. There he studied the classics, and received a liberal arts education. He especially enjoyed mathematics, and Greek and singing, which was, for him, like an intramural sport. He also took a job as an organist and choir director for a church in Mankato, which helped him support himself. He graduated with a BA in Seashore went from his undergraduate studies to graduate work at Yale University. His degree was the first Ph. He continued on at Yale for two years of post doctoral work where he assisted Scripture in his experimental research. Seashore became an assistant professor of philosophy at the University of Iowa in and later was appointed dean of the graduate school. In that capacity he established a number of new programs as shown in this table. Seashore was the president of the American Psychology Association in

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Chapter 4 : University of Alberta Dictionary of Cognitive Science: Musical Pitch

To investigate year-olds' ability to detect pitch differences within a semitone, the Modified Sergeant Pitch Discrimination Measure (MSPDM), based on Sergeant's () pitch test, was developed and administered to subjects.

Schroeder Author Note The hypothesis, originally proposed by Galton and elaborated by Spearman, that there is a functional correspondence between sensory discrimination and general intelligence g continues to spark debate. Previous findings suggest that pitch discrimination and tactile discrimination are only weakly correlated with g. Although consistent with the neural processing speed explanation of g, these results cast doubt on a strong form of the sensory discrimination explanation of g. Sensory discrimination was introduced to provide a mechanism linking intelligence to heredity. Galton believed that ancestral inheritance influences the development of the nervous system and that differences in the nervous system influence basic information processing abilities. Two schools of thought arose on the nature of the basic information processing abilities suggested by Galton to underlie intelligence. Cattell a, b , on the other hand, held that the elementary basis of intelligence is information processing speed. Because this explanation suggests a different mechanism for explaining intelligence, it is consistent with a weak correlation between sensory discrimination and intelligence. Both hypotheses, when tested early on, were widely regarded as having been disconfirmed, after which they lay dormant for many decades, but both are now experiencing something of a renaissance Deary, , b; Jensen, Had Spearman known initially of the results of investigators such as Sharp and Wissler --which he became aware of and cited in his article--he never would have completed the important study on which his article was based. As it happened, Spearman went on to test his theory of a strong relation between sensory discrimination and intelligence using a method adequate for assessing this relation. Theoretically, he regarded sensory discrimination as the simplest form of mental operation that was clearly intellective. Methodologically, he used the correlation corrected for attenuation due to unreliability. The debate surrounding sensory discrimination as a mechanism for g has continued in the recent literature on auditory inspection time AIT. Both the Spearman and Cattell explanations suggest an important role for elementary information processing in explaining g; the Spearman explanation, however, rules out the possibility of a negligible relation between measures of sensory discrimination and g. This article reports a study of the relations of two tests of sensory discrimination with a broad battery of other ability tests and with the g factor derived therefrom. The purpose is to shed light on the relations between sensory discrimination and other abilities--and, more specifically, to assess the relations between multiple forms of sensory discrimination and general intelligence. Examinees generally had either graduated from college, were in college, or were college-bound and were distributed across the ability range of that group. The battery of tests as a whole is thought to be useful for career guidance. Because the battery is designed to provide broad coverage of the cognitive-ability domain, it is well-suited to the derivation of major cognitive-ability factors such as g. The Hue Test Farnsworth, is a test of color discrimination. It is composed of four rows of 23 color caps. Each cap bears a single hue on top and is numbered on bottom according to its appropriate placement in the row, with consecutively numbered caps meant to occupy adjacent positions. An examinee is instructed to place caps in order according to the similarity of their color, with caps initially occupying random positions between two fixed caps at each end of a row. Errors are recorded when caps are placed in positions other than those indicated by their numbered positions. Initial error scores were computed in accordance with the specifications in the test manual Farnsworth, Because this yielded skewed scores, we then took the square root of the score for each cap before calculating row and total scores. For the correlational and factor analyses, we reflected the scores so that higher scores would indicate greater ability. The alpha reliability of row scores in these transformed data was. Examinees are presented with 80 pairs of tones and must report which tone in each pair is higher in pitch. The reference tone in each pair is Hz; in the easiest pair, the other tone is Hz, with pairs becoming progressively closer in pitch until the other tone is Hz. The test is fixed-pace with pairs of tones presented for 0. Volume levels are controlled by each examinee, with tones presented on a tape player through headphones. Previous research showed the alpha reliability of the nine subparts of the test to be. Analyses In all analyses, we partialled the effects of gender out of the test scores. We also partialled each score for age, and--because the relations with age were frequently curvilinear--for age-squared and age-cubed. The correlations among the Hue, Pitch Discrimination, and other standard-battery tests were computed. To identify g, two principal-axis factor analyses were performed on the 13 cognitive-ability tests in the JOCRF battery. One analysis was based on a hierarchical model of cognitive abilities; in it we extracted all factors with eigenvalues greater than one and then rotated these factors to the promax criterion. The amount of intercorrelation between factors was determined by setting the kappa value to 1. We then factored these factors, which yielded a single second-order factor with an eigenvalue greater than one, which we interpreted as g. The second analysis was based on a bifactor model of cognitive abilities. For this analysis we simply extracted the first unrotated factor and interpreted it as g. Because results for the hierarchical model and bifactor model were virtually identical factor scores for the two models correlated greater than. Finally, an extension analysis was performed in which the correlations of g with the Hue and Pitch Discrimination were computed. To investigate the possibility that our results were due to the inclusion of color-deficient along with color-normal examinees, we used scores on the Color Perception test to exclude the 75 examinees with mild or greater deficiencies in color vision and then repeated our analyses. Because the results were virtually identical, only the results including all examinees are reported. We used listwise deletion of missing values in all factor analyses and pairwise deletion when calculating correlations. Results For the initial error scores on the Hue prior to the square-root transformations , the mean score was This distribution is comparable to the general-population distribution reported in the test manual Farnsworth, After transformations, the mean score was Correlations between the Hue and the standard-battery tests, excluding Pitch Discrimination Table 1 ranged from. The correlation with Color Perception shows that the two tests measure related yet distinct traits. The mean score on Pitch Discrimination was This distribution is comparable to the general-population distribution reported by Seashore et al. Correlations between Pitch Discrimination and the other standard-battery tests Table 1 ranged from. These correlations show that these tests also measure related yet distinct traits. The correlation matrix of cognitive-ability tests is reported in Table 2. It shows the customary positive manifold of all-positive correlations. The analyses using a hierarchical model of cognitive abilities yielded four first-order factors, with initial eigenvalues before rotation of 4. In the oblique rotation, we allowed the first-order factors to have modest intercorrelations, ranging from. The first first-order factor showed its highest loadings on spatial tests such as Paper Folding, Memory for Design, and Wiggly Block and was interpreted as an index of structural visualization. The second first-order factor showed its highest loadings on memory tests such as Number Memory and Silograms verbal-associative memory and was interpreted as an index of memory. The third first-order factor showed its highest loadings on tests such as Number Series, Number Facility, English Vocabulary, and Analytical Reasoning, which are related in content to skills learned in school, and was interpreted as an index of academic ability. The fourth first-order factor showed its highest loadings on tests such as Inductive Reasoning and Observation, which involve quickly noticing visual features, and was interpreted as an index of rapid visual processing. The fifth first-order factor, with an initial eigenvalue of only. The first second-order factor showed high loadings on each of the lower-order factors. The second second-order factor, with an eigenvalue of only. The Hue was only moderately related to general intelligence. When the effects of age and gender were controlled, the correlation between the Hue and g was. Pitch Discrimination showed a somewhat lower partial correlation of. The correlations between general intelligence and both color discrimination and pitch discrimination are only modest. The low-to-moderate age-partialled correlation of. Our use of a diverse test battery with a sample that was over 15 times the size of the latter undergraduate sample, however, may yield more precise point estimates than in previous studies. The above findings on pitch discrimination, combined with our finding of an age-partialled correlation of. The present study can be considered a test of a strong form of the sensory discrimination explanation of g, which would predict high correlations between measures of sensory discrimination and g. The alternative neural processing speed explanation of g, on the other hand, is compatible with low correlations between measures of sensory discrimination and g. The modest correlations found in this study between measures of sensory discrimination and g are consistent with the neural processing speed explanation but cast doubt on a strong form of the sensory discrimination explanation.

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Chapter 5 : CiteSeerX â€” Citation Query Psychology of the vibrato in voice and instrument

Accuracy of the voice in simple pitch singing Carl calendrierdelascience.comre, "The Measure of a Singer", Scienee pitch discrimination, and the imitation of the pitch of.

Seashore was the president of the American Psychology Association in In , Seashore married Mary Roberta Holmes and in the next 10 years or so, they had four sons. Carl Seashore retired from Iowa in at the age of 70, but was called back in and served another 4 years as dean. He again retired, this time at 80 years of age. He died at Measurements of illusions and hallucinations in normal life. Studies from the Yale Psychological Laboratory 3: New psychological apparatus, II: Studies in Psychology from the University of Iowa 2: Elementary experiments in psychology. Psychology in daily life. The psychology of musical talent. Silver, Burdett and Company. Seashore, Carl Emil The Iowa pitch range audiometer, Lancet, October 15, , pp. Seashore, Carl Emil [ed. McGraw-Hill book company, inc. Seashore, Carl Emil A preview to college and life. University of Iowa Press. Applied psychology in Journal of Speech Disorders, 10, In search of beauty in music: A scientific approach to musical esthetics. In Carl Murchison ed. A history of psychology in autobiography. Iowa Pitch Range Audiometer Tonoscope.

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Chapter 6 : Sensory Discrimination and Intelligence

Musical pitch is a qualitative attribute of auditory sensation which indicates the highness or lowness of a musical note, in terms of its position in a musical scale (Seashore, /).

Received Apr 1; Accepted Oct This is an open-access article subject to a non-exclusive license between the authors and Frontiers Media SA, which permits use, distribution and reproduction in other forums, provided the original authors and source are credited and other Frontiers conditions are complied with. This article has been cited by other articles in PMC. Abstract According to prevailing views, brain organization is modulated by practice, e. Most recent results, using both neuropsychological tests and brain measures, revealed an intriguing connection between musical aptitude and second language linguistic abilities. A significant relationship between higher musical aptitude, better second language pronunciation skills, accurate chord discrimination ability, and more prominent sound-change-evoked brain activation in response to musical stimuli was found. These findings, together with their implications, will be introduced and elaborated in our review. When comparing adult musicians and non-musicians, differences have been found in the auditory, motor, somatosensory, and visuospatial areas at the cortical level as well as in the cerebellum Elbert et al. In addition to this, musicians seem to possess a larger anterior part of the corpus callosum than non-musicians Schlaug et al. Also, several other neural projections appear to be structurally modulated by increased myelinization in musicians Bengtsson et al. As Magne et al. However, it is far from evident how or why these anatomical changes occur. For instance, the role of the age at which practising a musical instrument was initiated and its effects on brain plasticity has not been widely investigated; however, pioneering evidence points out that the younger the subjects begin playing an instrument, the greater are the neuroplastic effects on the brain Schlaug et al. Correspondingly, it is not yet certain how much the specific demands set up by a given musical genre or instrument can modulate the underlying brain functions Tervaniemi, Neurofunctional accounts of music listening indicate the contribution of a network consisting of fronto-temporal and temporal areas in both the right and left hemispheres. With linguistic functions, the same areas have been shown to be activated with comprehension and production of language. As in music practising, the starting age seems to play a crucial role in foreign language acquisition skills. It is also recognized in foreign language learning that the pronunciation skills are more fluent and better when the second language has been started prior puberty Johnson and Newport, A number of studies indicate an overlap of the behavioral and neural resources between language and music. However, data indicating the lateralization of speech and music functions in the brain hemispheres and thus differential neural architectures for speech and music have also been obtained. According to those findings, specific neurocognitive functions intrinsic to music are governed by the right hemisphere and linguistic functions by the left hemisphere Zatorre et al. Nevertheless, the conceptualization of hemispheric specialization is not straightforward, and the involvement of other higher-order processes, such as memory functions, should also be considered. Any domain-specific process such as encoding of temporal acoustic properties of speech or a music sound, detecting pitch differences, etc. In other words, top-down executive processes within auditory pathways may have an important role in explaining the perception processes of speech and music stimuli Zatorre and Gandour, Additionally, individual variations must also be borne in mind when discussing brain functioning. For instance, different learning strategies could possibly reflect differential involvement of brain organization and may result in different neural representation of the material to be learnt. To sum up, learning and processing musical and linguistic material is composed of different neurofunctional levels with individual variations, ranged from higher to lower order, and each associated with different levels of neural organization. Only a few studies examine the possible effects of linguistic skills on improving musical skills. It has been shown, though, that speaking Mandarin which is one of the tonal languages can help an individual acquire absolute pitch Deutsch et al. Very recently, Elmer et al. They found evidence for a modulation of fronto-parietal brain regions as a function of language expertise and, further, that language training modulates brain activity in those regions involved in the top-down regulation of auditory functions. In parallel, there is an increasing body of evidence indicating that practising music affects language skills at both the cognitive and neural levels. Their results show that musician children detected incongruities in both music and language better than non-musician children did. The differences between the two groups of participants were also seen in auditory cortex functioning: The results showed that adult musicians perceived pitch variations better than non-musicians and that a late positivity developed around ms earlier in musicians than in non-musicians. The results showed that musical training not only improved pitch processing in speech but also the reading of irregular words. The roles of musical aptitude and musical training have recently gained greater attention as a contributing factor in the individual differences in language learning in general Anvari et al. Recent results, using both neuropsychological tests and brain measures, revealed an intriguing relationship between musical aptitude and linguistic abilities. These data, acquired in the context of the doctoral thesis project of the first author Milovanov, , will be introduced and elaborated below. In sum, it was found that individuals with more musical aptitude were better equipped to discriminate phonemic minimal pair contrasts and pronounce second language English phonemes than individuals with less musical aptitude. Moreover, the more musical individuals showed enhanced activation in the auditory cortex, reflected by the mismatch negativity MMN when compared to less musical individuals. An Empirical Endeavor The relationship between musical aptitude and linguistic abilities, particularly in terms of second language pronunciation skills and phoneme discrimination skills, was examined in a large project Milovanov et al. It consisted of both behavioral and brain measures of Finnish-speaking children age range 10â€"12 years or young adults age range 20â€"29 years. Based on prior behavioral investigations Milovanov et al. Linguistic capacities were determined by Wechsler or Wechsler , and a pronunciation test, in which English phonemes that are typically difficult for Finnish speakers were read onto a minidisc player after a native speaker model Milovanov et al. A discrimination task of phonemic minimal pairs was also conducted. Moreover, an analogous discrimination task of musical minimal pairs, namely chords that differ slightly in pitch was executed. The musical aptitude test used in our experiments measures the accuracy and threshold of auditory discrimination Seashore et al. The laterality effects among children and adult groups were investigated by means of a dichotic listening DL test Hugdahl and Andersson, In DL, two different auditory stimuli are presented to the participant simultaneously, exactly at the same time, one to each ear, by using a set of headphones. Participants are asked to attend to one [Forced-Right FR or Forced-Left FL], or both of the auditory stimuli and are asked to report what they have heard Hugdahl, Here, special attention was paid to FR and FL conditions in order to determine whether these two are differentially affected by musico-linguistic abilities and age Milovanov et al. We also investigated the ability to preattentively discriminate between slight changes in sounds: To this end, event-related brain potentials were performed in accordance with the MMN paradigm. Novel Findings In Milovanov et al. The subjects were tested on the production of English phonemes and on a discrimination task of phonemic minimal pairs. Their musical aptitude was determined by the Seashore musicality test. It was found that performance on the English phoneme discrimination test was not connected with their English phonemic production ability. Moreover, the phonemic discrimination ability did not differ between the three test groups. Yet, performance on the English pronunciation test was better for subjects with musical aptitude than with less musical aptitude. In Milovanov et al. Subjects differing in musical ability, as tested with the Seashore musical aptitude subtests, listened to consonantâ€"vowel CV syllables presented dichotically under three different attention instructions: The results showed that musical aptitude and age interacted with the ability to use attention to modulate a bottom-up laterality effect. Only adults who performed well in the Seashore musical aptitude test and practised music regularly showed more accurate left ear monitoring skills when listening to Finnish CV-syllables. Therefore, based on the result described above, it can be inferred that those subjects with more advanced musical aptitude use the right hemisphere more in language processing in comparison with the non-musical subjects. Also, the musical subjects may possibly pay more attention to the musical components of language than the non-musical subjects. Twenty children with advanced English pronunciation skills had better musical skills as measured by the Seashore musicality test than 20 children with less accurate English pronunciation skills. The individual Seashore subtests indicated that the participants with advanced pronunciation skills were superior to the participants with less-advanced pronunciation skills in pitch discrimination ability, timbre, sense of rhythm, and sense of tonality. The results in time or loudness subtests did not differ significantly between groups. Moreover, two behavioral discrimination tests were conducted, both before and after the pronunciation training period. First, the children were required to distinguish the phonemic dissimilarities between English and Finnish through triplets based on minimal pair contrasts of the phonemes, e. The advanced pronunciation group outperformed the participants with less-advanced pronunciation skills in terms of a higher number of correct answers and a smaller number of mistakes in both the music and phonemic discrimination tests before and after the training measured by the Error rate. For the less-advanced pronunciation group, triad contrasts were more difficult than the phonemic contrasts both before and after the training. Both test groups marginally improved their phonemic discrimination skills after the training. We also investigated whether children with a more advanced performance in foreign language production represent musical sound features more readily in the preattentive level of neural processing compared with children with less-advanced production skills. Sound processing accuracy was examined by means of ERP recordings. The ERP data accompany the results of the behavioral tests: The MMN lateralization pattern did not differ between the test conditions nor the test groups. Taken together, the results could imply that musical and phonemic skills may partly be based on shared neural mechanisms. The subjects were the same as described in Milovanov et al. The music sound was a violin tone C4, fundamental frequency The standard and deviant durations of the violin tones were equivalent to those of the speech sounds. The subjects with advanced pronunciation skills and greater musical aptitude were able to preattentively distinguish the duration difference in both conditions more effectively than the less-advanced pronunciation group with less musical aptitude. Only the advanced pronunciation group showed an MMN lateralization effect: Moreover, ERP data show that, irrespective of general musical aptitude, duration changes from to ms are more prominently and accurately processed in music than in speech sounds. However, one must bear in mind that reducing the duration of speech sounds from to ms may not necessarily have the same perceptual consequences as reducing the duration of a violin sound by the same amount since speech and music sounds are known to differ in their perceptual attributes Tervaniemi et al. Discussion and Conclusion Our review aims at introducing recent evidence about whether musical aptitude could be a crucial factor in learning foreign language pronunciation and discrimination skills. To this end, we introduce empirical evidence about the facilitating role of musical aptitude on foreign language pronunciation acquisition and phonemic and listening discrimination skills. This evidence was obtained from children and adult subjects without any neurological disorders or learning disabilities using various behavioral and brain recording paradigms. Within the current framework, it seems that music and language are closely related neurocognitive systems Patel, Music is one of the oldest, and most basic, socio-cognitive domains of the human species Koelsch, Primate vocalizations are determined by music-like features, such as pitch, timbre, and rhythm. Fine-grained temporal processing is fundamental to both speech and language Alcock et al. In addition, Overy is of the view that musical training develops temporal processing abilities, which are also relevant to phonological segmentation skills. Most recently, Goswami and colleagues have emphasized the role of musical processing for speech processing and the readings skill development: However, the role of possibly shared neural mechanisms between linguistic and musical functions is still unsettled. This is the case even though there is evidence that musical training improves sensory encoding of dynamically changing sounds, which, in turn, helps with linguistic coding. Koelsch is of the view that the human brain processes music and language with overlapping cognitive mechanisms in overlapping cerebral structures. This view promotes the apparent relationship between music and language which seems to be present from the very early stages of life.

Chapter 7 : Carl Emil Seashore

WILSON, W. E. Use of the Seashore measures of musical talents in the prediction of certain academic grades for music students at Pennsylvania State College. Unpublished master's dissertation, Pennsylvania State College,