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Research Article

Pilot Research for the Assessment of Neuroanatomical Correlates in Relation to Brain Talents Identified Through the Six Seconds Emotional Intelligence Assessment

Iannoccari Giuseppe Alfredo[1, *], Cariani Claudia Tania[2], Domenico Rega[3], Fariselli Lorenzo[4], Iseppato Ilaria[4]

[1]Department of Health Sciences, University of Milan, Milan, Italy
[2]FusionIE, Allenamenti di Intelligenza Emotiva, Cusano Milanino, Milan, Italy
[3]Fondazione Piccola Opera Charitas Giulianova, Teramo, Italy
[4]Six Seconds Italy & Europe, Bologna, Italy

Abstract

The current research is centered on investigating the neurophysiological correlates associated with various talents, with the goal of determining whether specific brain areas are activated during the expression of these talents. The study specifically investigates individuals with different occupational roles, distinguishing between social/healthcare and non-healthcare (administrative) positions. The research was conducted in three phases. The initial phase involved the selection of 60 employees from the Piccola Opera Caritas of Giulianova. Participants were administered the Brain Talent Profile questionnaire to gather information about their talents. The second phase focused on identifying neuroanatomical correlates using the BrainBit helmet. Participants engage in various brief activities while wearing the EEG headband, suitable for both neurofeedback and brain activity measurements. The final phase was dedicated to analyze the data collected through the Brain Brief Profile, which comprises three domains: Perception, Evaluation, and Action. Our hypothesis suggests significant correlations between participants' talents and recorded EEG patterns. To validate this hypothesis, the outcomes derived from the Social and Emotional Intelligence (SEI) test were compared with EEG measurements. This research holds potential applications in the recruitment phase, providing insights into the neurological basis of talents in prospective employees. It may offer advantages in training initiatives dedicated to enhancing talents and skills across diverse organizational roles. The emphasis on various job roles, particularly in the social/healthcare and administrative sectors, strengthens the practical relevance of the study for talent assessment and development within organizational contexts. In summary, our research aims to bridge the gap between talents and neurophysiological correlates, with potential implications for recruitment and training strategies within organizational settings.

Keywords

Talent, Organizational Role, Brain Mapping, EEG, Cognitive Skills

[*]Corresponding author: g.iannoccari@assomensana.it (Iannoccari Giuseppe Alfredo)

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1. Introduction

Effectively managing talent has become crucial for organizations worldwide, serving as a key tool to gain a competitive advantage through human capital [1, 2]. While the term 'talent' universally denotes a special natural ability or aptitude that sets individuals apart, the ongoing discourse among scholars centers on the dichotomy of innate versus acquired talent [3-7]. This critical debate not only shapes our understanding of the origin and development of talents but also underscores the complexity surrounding their definition and measurement in various fields. Recent theories propose a more nuanced perspective, suggesting that talents emerge through a complex interaction between inherent predispositions and environmental factors, introducing a continuum range from innate to acquired [8-10].

The recognition of talents is closely tied to identifying strengths, defined as recurring patterns of thought, feeling, or behavior that can be productively applied [11, 12]. The correlation between brain activity and talents has been a subject of investigation, particularly with the advent of modern neuroscience techniques like EEG (Electroencephalogram) and fMRI (functional Magnetic Resonance Imaging) [13]. The human brain, comprised of over 100 billion neurons, communicates through electrical signals, giving rise to brain waves of different frequencies [14]. EEG, based on these frequencies, has been employed to quantify human performance in cognitive tasks [15].

EEG has been extensively used to measure brain activity during various activities, including physical, artistic, and creative endeavors [16-20]. Notably, differences in EEG power have been observed in creative subjects, with a focus on frontal brain areas, providing insights into the neural basis of talents such as divergent thinking, poetry composition, and musical improvisation [21-24]. EEG alpha power has been identified as particularly sensitive to creativity-related demands such as dance or verbal creativity [25-27]. Studies comparing EEG signals between artists and non-artists further emphasise the distinct neural patterns associated with creative activities [28].

The research presented aims to answer the following questions: Can neuroscience give us an indication of where our talents/abilities reside in the brain? Does expressing a talent mean activating a specific area of our brain? Our hypothesis is that there are significant correlations between the talents acted by the subjects and the EEG tracks. We chose to compare results obtained by the SEI test and the EEG measurements. The study concentrated on subject belonging to different working roles: the social/healthcare and non-healthcare (or administrative) workers. We believe this could be a useful tool both in the recruitment phase and in the training activities aimed at increasing talents/skills in subjects' employees in organizational roles.

2. Materials and Methods

2.1. The Brain Talent Profile, SEI

This test is grounded in the Six Seconds model of Emotional Intelligence, a tripartite model developed in 1997 by Peter Salovey) and John Mayer [29]. One way to assess the reliability of a scale (a set of items in a questionnaire) is to calculate the internal consistency of the factors within it. Internal consistency measures how closely the items included in the scale are related to each other. Cronbach's Alpha coefficient was also used to calculate the reliability of the factors comprising the SEI. This index ranges from -1 to +1, and a coefficient with a positive value greater than 0.6 is considered statistically reliable in research.

2.2. Neuroanatomical Correlates Detection

Participants were asked to engage in various brief activities, such as watching a video and responding to questions, while performing these activities, they wore an EEG headband, suitable for both neurofeedback and brain activity measurements, in medical and psychological contexts. To improve conductivity and maintain high hygiene standards, a sponge soaked in a solution of water and alcohol was used between each electrode and the scalp. After mounting the headband and confirming that the signal was clear with no interference due to excessive hair or a sebum-rich scalp at the electrode sites, which could compromise signal detection, participants were instructed to relax, sit comfortably, and prepare for the beginning of the activities. The instrument has four channels, dry electrodes, a sampling frequency of 250 Hz, and a voltage range of ±0.4 V. It collects data that can be converted and interpreted using the BrainBit Inc. software, Version 2.2.15. The analysis was conducted by cross-referencing the Brain Brief Profile (BT) profiles with the responses to the questions and EEG measurements for each subject. During the research, the Brain Talent Profile was employed, along with three custom-prepared activities and the BrainBit EEG signal detection headband.

2.3. Experimental Operations

The research activities took place on March 14 and 15, 2022, at Villa Fiorita, a location made available by the Piccola Opera Charitas Foundation of Giulianova. The experimental operations were conducted in a room with a closed door, equipped with two workstations, tables, and chairs, to allow the four researchers to conduct EEG readings during the administration of the three tasks described earlier. Participants entered the room at scheduled times, and each operation on a participant lasted for about twenty minutes. To capture EEG readings, the BrainBit headset was applied to each subject. Participants were encouraged to respond calmly to the tasks and not to worry about their answers. The answers were con-

fidential and could not be disclosed externally except in anonymous aggregate form. Each response had a pre-set time of three minutes, specifically designed to record adequate brain electrical activity and promote the expression of talents that the experimental tasks aimed to elicit.

2.4. Data Analysis

Descriptive and inferential analyses were conducted to outline the demographic and professional profiles of the participants and investigate any relationships between the use of talents in the three macro areas during task completion and the electrocortical activation of the temporal or occipital lobes of the two hemispheres. These analyses were carried out using the Jamovi software [30].

3. Results

The research unfolded in three phases: the first involved subject sample selection and Brain Talent Profile questionnaire administration; the second focused on detecting neuroanatomical correlates using the BrainBit helmet, and the third encompassed data analysis and report preparation. The Brain Brief Profile comprises three areas: Perception, Evaluation, and Action. Perception involves integrating cognitive and emotional information, Evaluation assesses the balance between risks and opportunities, and Action explores the motivation balance between short and long-term goals. Each area is subdivided into two parts, namely cognitive or emotional for Perception, reflective or innovative for Evaluation, and practical or idealistic for Action. The workflow of the research is presented in Figure 1.

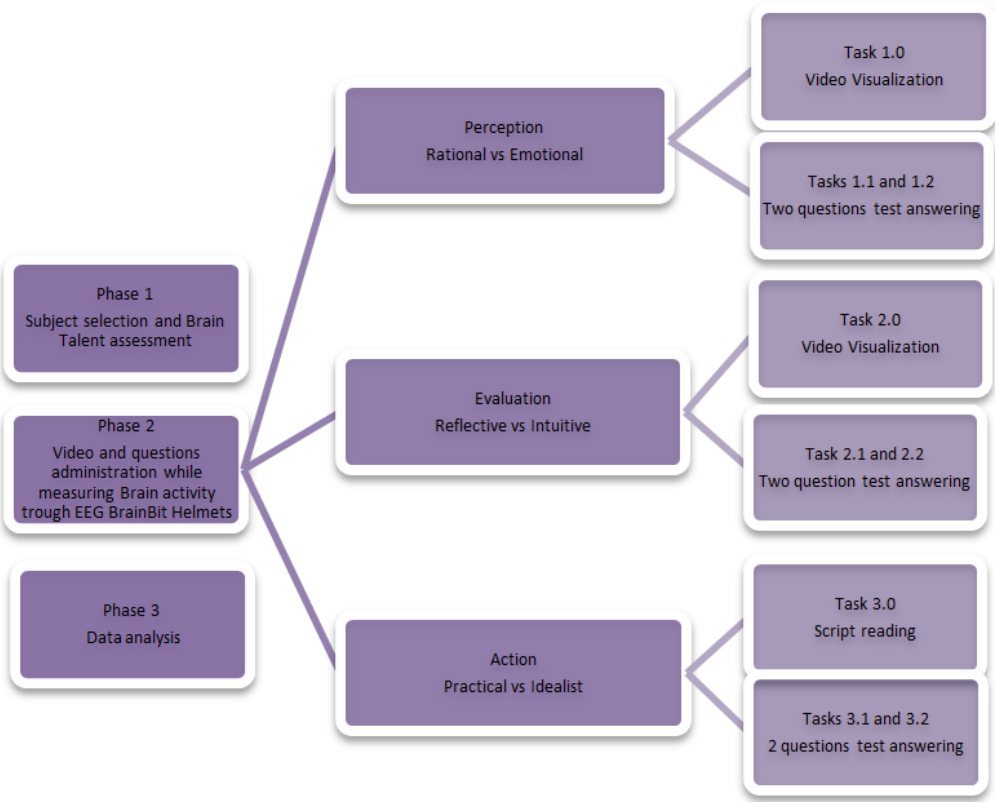


Figure 1. *Workflow of the project.*

3.1. Phase 1

3.1.1. Sample Selection and Characterization Based on Age, Gender, Education, Working Role

The research involved 60 employees of the Piccola Opera Caritas of Giulianova (TE) (hereinafter FPOC) of age, sex and mixed professions. The sample is made up of people aged 22 to 63, with an average age of 43 (Figure 2A). The subjects who participated in the research were almost equally male and female, with a slight prevalence of women (Figure 2B). The level of education of the sample is quite high: more than 55% have a university degree, while only 10.6% have attended compulsory school (Figure 2C). The population is perfectly heterogeneous, evenly divided into Non Healthcare workers and Healthcare workers. The majority of graduates work in the healthcare sector, while in the Non-Healthcare area, there

are mainly individuals with a diploma (Figure 2D).

3.1.2. Talent Assessment Using the Sei Questionnaire

Subsequently, each participant was presented with the SEI questionnaire, from which it was possible to compile descriptive statistics on the detected profiles (Brain Talent Profile).

From the statistical analysis of contingency between the Roles and the Talents, for each question, no meaningful values have emerged that can justify the hypothesis that there is a relation between the two variables (χ^2 between 0.5 and 1,4 and p values >0.1), (Figure 3, Table A1).

The first part of the analysis, the socio-demographic descriptive data of the sample and the contingency relationships between the variables Education and Roles cross-referenced with the various Talents, did not reveal any evidence suggesting that the subjects had distinctive characteristics regarding roles they held.

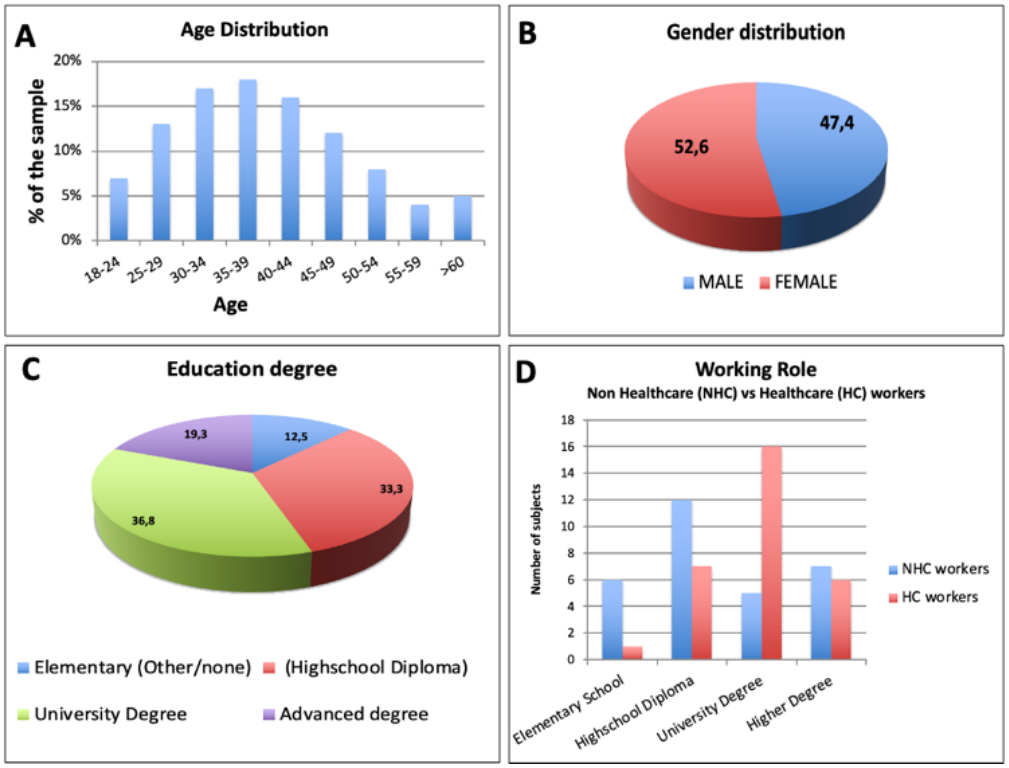


Figure 2. *Sample selection and characterization. A) sample distribution by age; B) gender distribution within the sample; C) Education level; D) working role vs education level.*

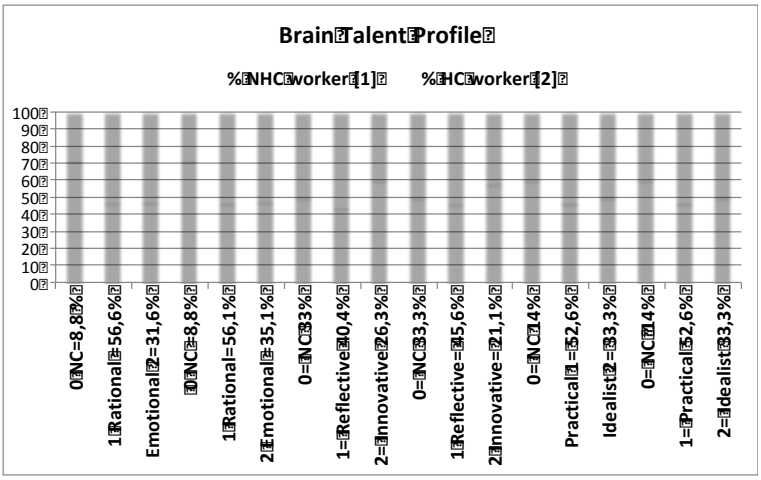


Figure 3. *Percent of Talent Quals distribuition. NC= Not classified, HC= Healthcare Workers, NHC= NON Healthcare Workers.*

3.2. Phases 2 and 3

Evidence of Neurophysiological Correlates, and Data Analysis

In this section we analyzed the neurophysiological correlates of the subjects in the sample while they were engaged in the three activities.

Activity 1: perception

The first activity is divided into three tasks and designed to bring out the talents belonging to the macro area of Perception. The exercise is structured to discern whether subjects are utilising skills from the Rational or Emotional Perception clusters.

Task 1.0 Viewing of a television commercials of a car brand, where the protagonist had the lion's head. From the Analysis of the Variance between the activation of the four waves, in the temporal and occipital lobes and between the right and left hemispheres, have emerged clue values for a significant difference in brain activation of subjects operating in the non Healthcare workers and Healthcare workers. In particular, significant difference in hemispheres asymmetry in the activation of the four waves was observed ($p. < 0.10$), which could mean a different electrical brain pattern among subjects in different occupational areas (Figure 4A, 4D).

Task 1.1 Question answering. Detection of correlates took place while the subjects were filling out the question "What impressed you most, after viewing the first video?". From this analysis, no values emerged that could suggest a significant difference between the roles of Healthcare and Non Healthcare workers, or in brain activation between the 59% of the subjects who expressed a talent Rational compared to 31% of the subjects who expressed themselves in an emotional manner, (Figures 4B, 4F, Figure A1). However, there was a small significant difference in the asymmetry between the hemispheres regarding the activation of theta waves (p. 0,68) in Rational subjects, circumstance that could mean a different electrical arrangement of the brain between subjects who express themselves with different talents (Figure 4E). Incidentally, Theta waves are activated during the state of deep sleep, but if they appear with certain intensity during wakefulness, they are a sign of empathy and openness, to unconscious processes for solving problems. In this case, the viewing of the fantastic film could have induced a brain state of this type.

Task 1.2 Question answering. Detection of correlates took place while the subjects were filling out the answer to the question: how would you describe this spot with a sentence? From the statistical analysis no values emerged that could suggest a significant difference between the roles of Healthcare and Non Healthcare workers in brain activation among 56% of the subjects who expressed a talent Rationally compared to 35% of the subjects who expressed in an Emotional way, while 9% was not clearly defined in one of the two categories (Figures 4C, 4G, Figure A2).

A — Activity 1 / task 1.0 NHC vs HC workers

Working Role	Central Lobe				Occipital Lobe				Asymmetry			
	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
NHC worker [1]	19059	24148	17124	10074		23827	17198	10112	0.0732	0.0511	0.0436	-0.0450
HC worker [2]	22958	28428	21355	12410		33823	24654	14780	2,4982	2,1625	2,4325	2,4132
p values One-Way ANOVA	0.583	0.691	0.552	0.579		0.397	0.345	0.314	0.348	0.349	0.348	0.335

B — Activity 1 / task 1.1 Rational vs Emotional

Talent	Working Role		Central Lobe				Occipital Lobe				Asymmetry			
0, 1, 2	NHC worker [1]	HC worker [2]	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
0 NC=8,8 %	71,4	28,6	15484	17208	14013	8246	1730	19543	16123	10647	0.0760	0.0660	0.0100	-0.0500
1 Rational =56,6%	47,1	52,9	18146	21773	16500	9512	2041	24635	18309	10666	2,04	1,88	2,14	2,12
Emotional 2=31,6%	47,4	52,6	26007	33638	25563	14611	3005	36182	26662	15736	-0.0335	-0.0929	-0.0947	-0.1012
p values One-Way ANOVA			0.602	0.605	0.580	0.583	0.605	0.631	0.647	0.674	0.453	0.068	0.174	0.494

C — Activity 1 / task 1.2 Rational vs Emotional

Talent	Working Role		Central Lobe				Occipital Lobe				Asymmetry			
0, 1, 2	NHC worker [1]	HC worker[2]	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
0 NC =8,8%	71,4	28,6	14677	18145	13744	7777	16953	19128	15468	10159	0,00	-	-	-
1 Rational=56,1%	46,9	53,1	19002	20837	16632	9486	18559	21020	16718	9437	2,19	1,91	2,24	2,20
2 Emotional =35,1%	47,6	52,4	22102	27998	21046	11923	30319	37467	26055	15557	-	-	-	-
p values One-Way ANOVA			0.802	0.794	0.797	0.784	0.544	0.499	0.590	0.572	0.389	0.498	0.549	0.429

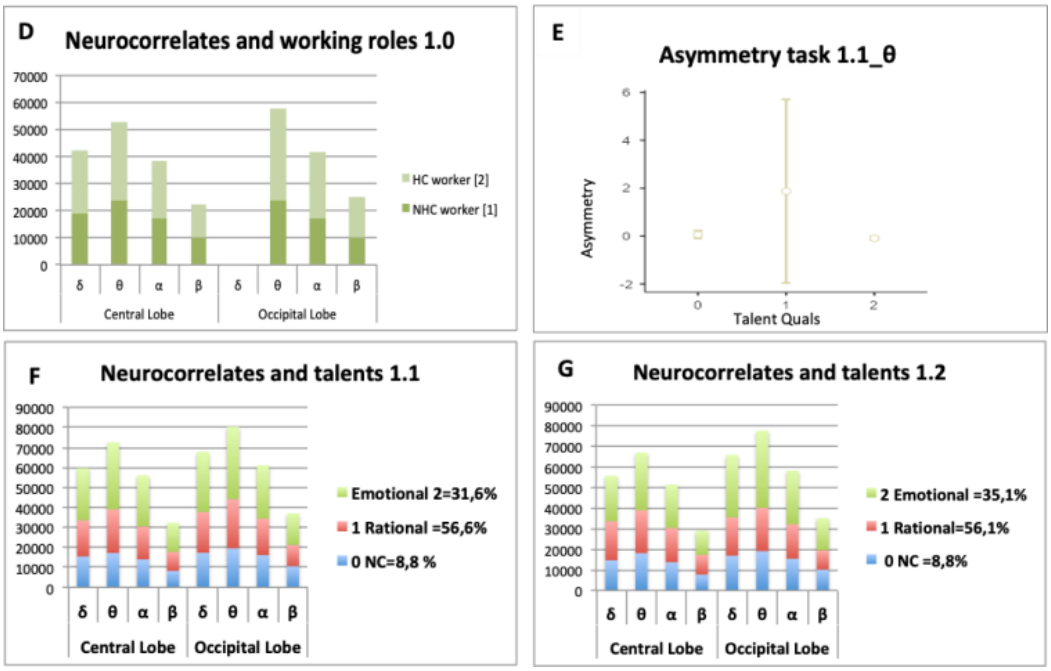


Figure 4. *Perception. Measurement of the four waves, in the temporal and occipital lobes, and hemispheres asymmetry. Activity 1: perception, Task 1.0 Viewing of a television commercials of a car brand, where the protagonist had the lion's head (A, D); Task 1.1 Answering to the question: what impressed you most, after viewing the first video? (B, F); Task 1.2 Question answering: how would you describe this spot with a sentence? (C, G). Asymmetry of theta waves (E).*

Activity 2: evaluation

The second activity is tailored to unveil skills within the Evaluation macro-area, specifically assessing whether the individual evaluates the situation in an Innovative or Reflective manner.

Task 2.0 Watching a video in which the protagonist finds themself stranded on Mars in a difficult situation.

The analysis of this task revealed indicative values for a significant difference in the brain activation of individuals working in the Social and Health and Administrative fields. In particular, it was observed a significant difference ($p. < 0.10$) in the occipital lobes with high activation in the right cerebral hemisphere, for all four electrical waves (Figure 5A, 5D, Figure A3). This circumstance could indicate a different electrical arrangement in the brains of individuals working in different occupational areas, particularly higher in the Social and Health role when involved in tasks representing critical situations. The reported activation of the occipital lobe may be related to the dominance of the visual modality, which predominantly activates these cortical areas. However, it remains not clear whether this activation is due to the characteristics of the individuals involved or if the role has somehow accentuated these characteristics compared to the Administrative role.

A — **Activity 2 / task 2.0 NHC vs HC workers**

Working Role	Central Lobe				Occipital Lobe				Asymmetry			
	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
NHC worker [1]	14896	18628	14303	8028	14534	16521	12880	7386	-0.0136	-0.0368	-0.0429	-0.0525
HC worker [2]	18351	20650	15699	9327	27394	33486	23491	14090	2,4217	2,0131	2,3559	2,299
p values One-Way ANOVA	0.578	0.810	0.814	0.708	0.150	0.140	0.162	0.139	0.322	0.323	0.329	0.332

B — **Activity 2/ task 2.1 Reflective vs Intuitive**

Talent	Working Role		Central Lobe				Occipital Lobe				Asymmetry			
0, 1, 2	NHC worker [1]	HC worker [2]	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
0= NC 33%	50,0	50,0	12026	14668	10744	6405	21730	29459	19478	12005	3,86	3,69	3,91	3,78
1= Reflective 40,4%	44,0	56,0	17706	21955	16636	9609	19827	22330	17012	9956	0,00	0,00	0,00	0,00
2= Innovative 26,3%	60,0	40,0	18870	19446	15891	9248	17284	17777	14305	8333	-	-	-	0,00
p values One-Way ANOVA			0.556	0.727	0.604	0.635	0.887	0.638	0.813	0.755	0.176	0.387	0.295	0.602

C	Activity 2/ task 2.2 Intuitive vs Meditative													
Talent	Working Role		Central Lobe				Occipital Lobe				Asymmetry			
	NHC worker [1]	HC worker [2]	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
0= NC 33,9%	50,0	50,0	8928	11451	8241	4924	17964	23458	15255	9549	4,06	3,75	3,89	3,83
1 Reflective= 45,6%	46,4	53,6	19673	22810	17619	10211	19159	21426	16808	9960	0,00	0,00	0,00	0,00
2 Innovative= 21,4%	58,3	41,7	16373	16968	13886	7988	14859	14519	12109	7161	0,00	-	-	-
p values One-Way ANOVA			0.251	0.459	0.329	0.360	0.864	0.643	0.793	0.778	0.294	0.144	0.224	0.409

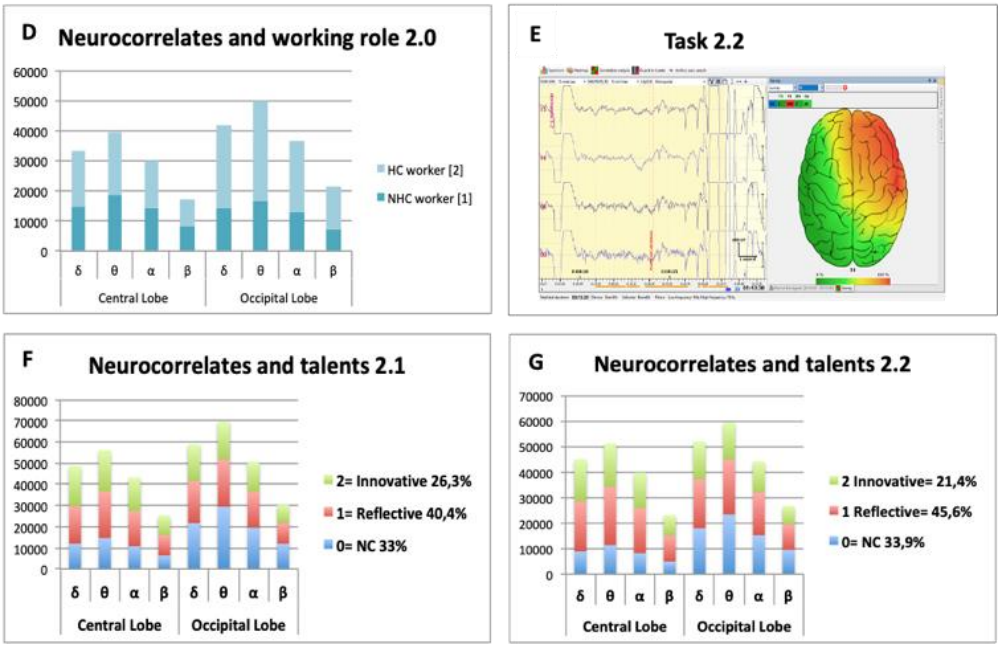


Figure 5. *Evaluation. Measurement of the four waves, in the temporal and occipital lobes, and hemispheres asymmetry. Activity 2: evaluation, Task 2.0 Watching a video in which the protagonist finds themself stranded on Mars in a difficult situation (A, D); Task 2.1 Answering to the question: How do you handle this situation? (B, F); Task 2.2 Answering to the question: How did you feel in this exercise? (C, G). Electrical activity of the right temporal lobe hemisphere (E).*

Task 2.1 Question answering.

The assessment of the correlates took place while the subjects were engaged in answering the question "How do you handle this situation?" after viewing the second video. From the Analysis of Variance between the activation of the four waves in the temporal and occipital lobes and between the right and left hemispheres, no values emerged that could suggest a significant difference between the Social and Health and Administrative roles or in brain activation between the 40.4% of subjects who expressed a Reflective talent compared to the 26.3% of subjects who expressed themselves in an Innovative manner (Figure 5B, 5F, Figure A4). However, significant findings did emerge in terms of asymmetry between the cerebral hemispheres in the group consisting of 20 subjects (33.3%) for whom it was not possible to assign them to either of the two predefined categories (Reflective/Innovative) (Figure 5B). This group of 20 subjects comprises 14 females (8 in the Administrative role and 6 in the Social and Health role) and 6 males (2 in the Administrative role and 4 in the Social and Health role). The 6 males range in age from 25 to 50 years, while the ages of the females are distributed between 30 and 62 years.

Task 2.2 Question answering. The assessment of the correlates took place while the subjects were engaged in answering the question "How did you feel in this exercise?", after viewing the second video and responding to question 2.1. From the Analysis of Variance between the activation of the four waves in the temporal and occipital lobes and between the right and left hemispheres in relation to Talents, values emerged that could suggest a significant difference in brain activation between the 40.4% of subjects who expressed a Reflective talent and the remaining 26.3% of subjects who expressed themselves in an Innovative manner, and 33% who were not assigned to any category (Figure 5C, G). The Reflective individuals showed greater activation of three out of the four waves (excluding Delta, a circumstance not explainable based on the available data) in the temporal lobe of the right hemisphere (as inferred from the positive sign of the mean indicating the right hemisphere, while the negative sign is related to the left hemisphere (Figure 5E).

A — Activity 3 / task 3.0 NHC vs HC workers

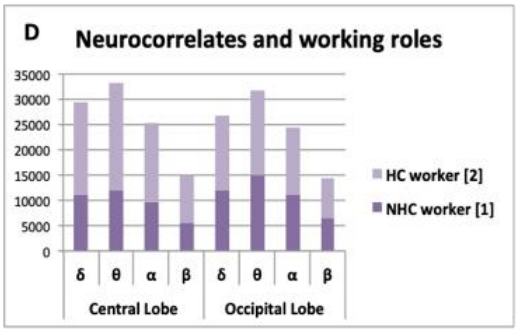
Working Role	Central Lobe				Occipital Lobe				Asymmetry			
	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
NHC worker [1]	11071	12063	9640	5576	12101	15029	11249	6559	0	-	-	-
HC worker [2]	18236	21133	15655	9426	14447	16684	12972	7745	2,1	2,3	2,5	3,4
p values One-Way ANOVA	0,688	0,833	0,758	0,72	0,334	0,315	0,336	0,311	0,3	0,3	0,3	0,3

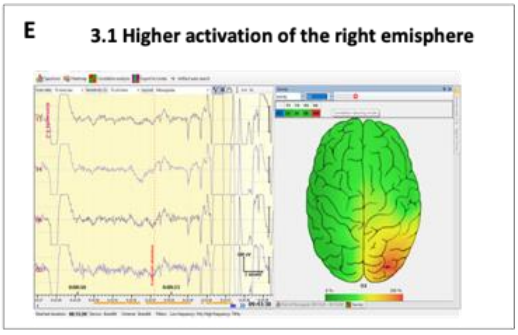
B — Activity 3 / task 3.1 Practical vs Idealist

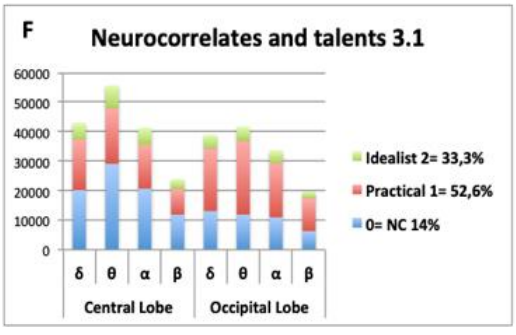
Talent	Working Role		Central Lobe				Occipital Lobe				Asymmetry			
0, 1, 2	NHC worker [1]	HC worker [2]	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
0= NC 14%	60,0	40,0	20201	29129	20762	11901	13175	11943	11009	6346	0	-	-	-
Practical 1= 52,6%	46,7	53,3	17195	18871	14839	8732	21168	25016	18410	11151	2,13	2,42	2,76	3,28
Idealist 2= 33,3%	50,0	50,0	5700	7775	5782	3292	4661	4766	4302	2238	0	-	-	-
p values One-Way ANOVA			0.093	0.221	0.167	0.158	0.046	0.053	0.059	0.040	0.608	0.608	0.604	0.481

C — Activity 3 / task 3.2 Practical vs Idealist

Talent	Working Role		Central Lobe				Occipital Lobe				Asymmetry			
0, 1, 2	NHC worker [1]	HC worker [2]	δ	θ	α	β	δ	θ	α	β	δ	θ	α	β
0= NC 14%	60	40	23264	32616	21000	13156	15141	13822	12549	7309	0	0	0	0
1= Practical 52,6%	47	53	17038	18583	18000	8628	20802	24801	18135	11057	2,36	2,18	2,81	3,29
2= Idealist 33,3%	50	50	5527	7435	4000	3163	4460	4461	3958	2171	0	0	0	0
p values One-Way ANOVA			0.084	0.198	0.153	0.140	0.035	0.040	0.044	0.034	0.611	0.562	0.485	0.270







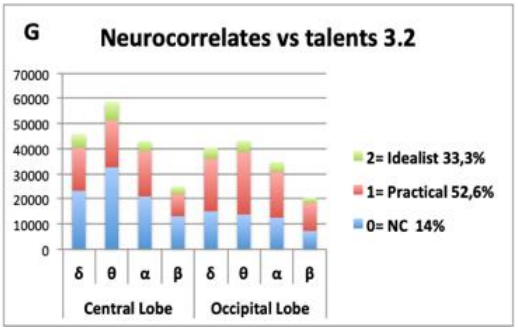


Figure 6. *Action. Measurement of the four waves, in the temporal and occipital lobes, and hemispheres asymmetry. Task 3.0 reading a case. The subjects were engaged in reading an episode presenting a situation in which he/she must decide what to do regarding an incident that puts them in conflict between reporting an employee who has embezzled money from the company or keeping it silent (A, D); Answering to the question: what do you do, after reading the passage describing a critical situation? (B, F). Task 3.2 Answering to the question: and for what reasons?" after reading the passage describing a critical situation and responding to question 3.1 (C, F). Electrical activity of the right occipital lobe hemisphere (E).*

Activity 3: action

The third activity of the research delves into the "Action" area, focusing on identifying which areas of practical or idealistic talents individuals deploy when taking action. This

segment comprises three tasks to explore different facets of participants' action-oriented skills.

Task 3.0 reading a scenario involving a conflict situation. The subjects were engaged in reading an episode presenting a situation in which he/she must decide what to do regarding an incident that puts them in conflict between reporting an employee who has embezzled money from the company or keeping it silent. Notably, during this task, distinct values emerged in the brain activation patterns of subjects in Administrative and Social/Health fields. Significant differences in the right cerebral hemisphere were observed across all four electrical waves ($p < 0.10$), suggesting a potential variation in the electrical arrangement of the brain based on occupational roles. This disparity was particularly pronounced in individuals with roles in Social and Health settings when confronted with decision-making tasks in conflict situations (Figure 6A, 6D).

Task 3.1 Question answering. The subjects were engaged in answering the question "What do you do?", after reading the passage describing a critical situation. From the analysis values emerged that could suggest a significant difference in brain activation among the 52.6% of subjects expressing a Practical talent, compared to the 33.3% expressing an Idealistic talent, and the 14% who were not clearly classified into either category. In particular, the analyses highlight that subjects expressing a Practical talent exhibit greater, statistically significant ($p<0.01$) activation in the occipital lobe, with higher activation in the right hemisphere (as inferred from the positive sign of the mean indicating the right hemisphere, while the negative sign is related to the left hemisphere) in all four electrical waves (Figure 6E). There is also a unique observation related to the activation of Delta waves in the parietal lobe in subjects classified as "unclassified," which could be explained by a brain configuration associated with deeper and more open problem-solving thinking (Figure 6B, 6F).

Task 3.2 Question answering. The subjects were engaged in answering the question "And for what reasons?" after reading the passage describing a critical situation and responding to question 3.1. The data analysis revealed values that could suggest a significant difference in brain activation among subjects expressing a Practical or Idealistic talent, or were not clearly classified into either category (Figure 6C, 6F). In particular, subjects expressing a Practical talent exhibit greater activation in the occipital lobe, with higher activation in the right hemisphere (Figure 6E). There is also a unique observation related to the activation of Delta waves in the parietal lobe in subjects classified as "unclassified," similar to the findings in question 3.1.

4. Conclusions

The present research successfully addressed the initial question that prompted the study: whether different neurophysiological correlates are associated with the enactment of various talents. Two hypotheses were explored: the "null" hypothesis positing no differences in brain activation across different talents, indicating no significant distinctions in EEG patterns regardless of the task or talent. Conversely, the "alternative" hypothesis advocates that the expression of diverse talents would trigger distinct electrocortical patterns.

The research project was meticulously structured, enabling sample subjects to demonstrate a spectrum of talents within six distinct macro areas. This was achieved through their responses to stimulus tasks designed to elicit varied mental patterns, allowing for a comprehensive examination of potential differences.

The analysis of responses has uncovered profiles that align with the alternative hypothesis, indicating that the execution of specific talents elicits distinct electrocortical patterns. Particularly, in the first task involving watching a car brand's TV commercial with a protagonist having a lion's head, asymmetrical activation between cerebral hemispheres was noted, with greater activation in the right occipital lobe. This disparity was more pronounced in the group of subjects in the Social and Health care role compared to those in the Administrative role.

Similarly, a notable difference was observed during the second task involving the viewing of a video (depicting an astronaut stranded on Mars, after a space mission) and in the third task, which involved reading a passage where subjects had to decide how to respond to a conflict situation involving an employee stealing money from the company. These three tasks, designed to activate different talents in the areas of Perception, Processing, and Action, produced distinct electrocortical patterns as anticipated by the research objectives.

An intriguing observation arose from the results of task 2.1, where 20 subjects were not classified into "Reflective" or "Innovative" talent categories. These subjects exhibited significant activation in the right temporal lobe. Qualitative analysis of their responses uncovered an inclination towards indecision, favoring explicit displays of emotional states experienced in that situation. Emotional states are known to be influenced by complex neural networks that impact brain functions. In this instance, there was substantial activation in the right hemisphere, prompting an intriguing question: Can certain emotional states create a form of brain short-circuit that inhibits decision-making?

One last finding concerns the correlation that emerged in tasks 3.1 and 3.2 (answering the questions "What do you do?" and "For what reasons?" related to the theft of money from the company's cash registers) with the EEG patterns of the right occipital lobe in the groups of Administratives who exhibited a Practical talent, possibly more inclined to make normative decisions without the intrusion of emotional or idealistic motives.

In conclusion, despite the pilot nature of the study and the need for refinement in certain broad-brush aspects for future investigations, the obtained results provide confidence in rejecting the null hypothesis. The alternative hypothesis is supported, instead, indicating clear correlations between EEG

patterns and the talents exerted by the subjects.

5. Discussion

Effective job performance relies not only on skills and goodwill but also on having the right tools. Expecting professionals to rely solely on goodwill is impractical in today's complex work environments. Predisposition, talent, and experience are essential pillars for success. Beyond physical tools, "soft skills" are crucial differentiators, shaping how individuals approach their roles. Imagine a healthcare professional lacking communication and empathy or an administrative worker with creativity but lacking analytical skills – the potential outcomes in their respective roles would vary significantly. Developing and understanding these mental and character tools is crucial for success in specific roles. Ensuring that individuals are well-equipped with the necessary skills and attributes not only benefits their own professional growth but also serves as a valuable contribution to the well-being of all stakeholders involved.

The present research was carried out within and on behalf of the Piccola Opera Charitas Foundation of Giulianova (hereinafter FPOC) - director: Domenico Rega - and Six Seconds Italy - director: Lorenzo Fariselli, and it originated from the idea of Tania Cariani, EQ (Emotional Quotient) Practitioner and Assessor. It should be considered a pilot study due to several conditions that characterized the research sample, the available measurement tools, and, most importantly, the research hypotheses aimed at verifying if there is a relationship between neurophysiological patterns and "talents' ' exhibited in specific situations. Although the study maintained an exploratory approach, it successfully outlined an indicative profile of the experimental variables and offered initial insights into the research questions. Notably, the study achieved a reliable differentiation of talents among the 60 subjects in the sample, considering factors such as roles, age, and education. Additionally, it identified neurophysiological patterns, revealing how subjects exhibited distinct brain electrical activation in response to specific tasks based on both their talents and roles. The prime condition that enabled the research to be carried out was the availability, support, and cooperation of the Piccola Opera Charitas Foundation in Giulianova. They facilitated the recruitment of the 60 sample subjects with specific socio-demographic characteristics necessary for the research analysis; provided an appropriate setting for the research, by making EEG recording spaces available for two workstations staffed by four researchers. They scheduled and coordinated the 60 research subjects' appointments with researchers for the neurophysiological pattern data collection, all within a short timeframe of just one and a half days. Moreover, they provided timely and motivated cooperation of the sample subjects during the data collection operations; hospitality and cordial reception provided by the Foundation's staff to the researchers, along with continuous support throughout the research activities. In addition to these strengths, which are not all mentioned here due to space constraints, there were other factors that contributed to the successful execution of the research, such as the availability of state-of-the-art portable EEG equipment provided by the "Università Cattolica del Sacro Cuore" in Milan and the University of Pavia, as well as the expertise of the research team in data collection and neurophysiological pattern analysis, which were essential to completing such a complex scientific endeavour.

Acknowledging the positive aspects highlighted, future research could benefit from considerations beyond the pilot study. The utilization of more advanced electroencephalographic equipment, featuring 32 or 64 channels, in collaboration with university laboratories, could enhance neurophysiological pattern recordings during cognitive tasks. Doubling the sample size would contribute to greater stability and interpretability of observed variations. Implementing a "double assessment control group" design, incorporating pre and post-assessments, would capture changes resulting from specific intervention protocols applied to the experimental group. This approach, involving practical and visual activities, not only aids in mapping brain areas related to talents but also detects changes arising from experimental interventions.

The obtained findings offer encouragement for additional research, suggesting the potential for future solid evidence. This evidence could prove valuable in recruiting individuals for diverse job roles and assessing the effectiveness of training activities aimed at enhancing competencies, especially in critical organizational roles.

Author Contributions

All authors made a substantial, direct and intellectual contribution to the completion of this research.

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Abbreviations

EEG: Electroencephalogram
fMRI functional Magnetic Resonance Imaging
FPOC: Piccola Opera Charitas Foundation of Giulianova
EQ: Emotional Quotient

Conflict of Interest

The authors declare no conflicts of interest.

Appendix

Figure A1. *Measurement of the four waves, in the central and occipital lobes, and hemispheres asymmetry. Task 1.1 Rational vs Emotional.*

Table A1. *Statistical analysis of contingency between the Roles and the Talent.*

Task	Talent	Working Role		Statistical Analysis	
	0, 1, 2	**% NHC worker [1]**	**% HC worker [2]**	**χ2**	**p**
	0 NC=8,8 %	71	29		
1.1	1 Rational =56,6%	47	53	1,46	0,5
	Emotional 2=31,6%	47	53		
	0 NC =8,8%	71	29		
1.2	1 Rational=56,1%	47	53	1,46	0,5
	2 Emotional =35,1%	48	52		

Task	Talent	Working Role		Statistical Analysis	
	0, 1, 2	**% NHC worker [1]**	**% HC worker [2]**	**χ2**	**p**
	0= NC 33%	50	50		
2.1	1= Reflective 40,4%	44	56	0,96	0,619
	2= Innovative 26,3%	60	40		
	0= NC 33,3%	50	50		
2.2	1 Reflective= 45,6%	46	54	0,476	0,788
	2 Innovative= 21,1%	58	42		
	0= NC 14%	60	40		
3.1	Practical 1= 52,6%	47	53	0,533	0,766
	Idealist 2= 33,3%	50	50		
	0= NC 14%	60	40		
3.2	1= Practical 52,6%	47	53	0,533	0,766
	2= Idealist 33,3%	50	50		

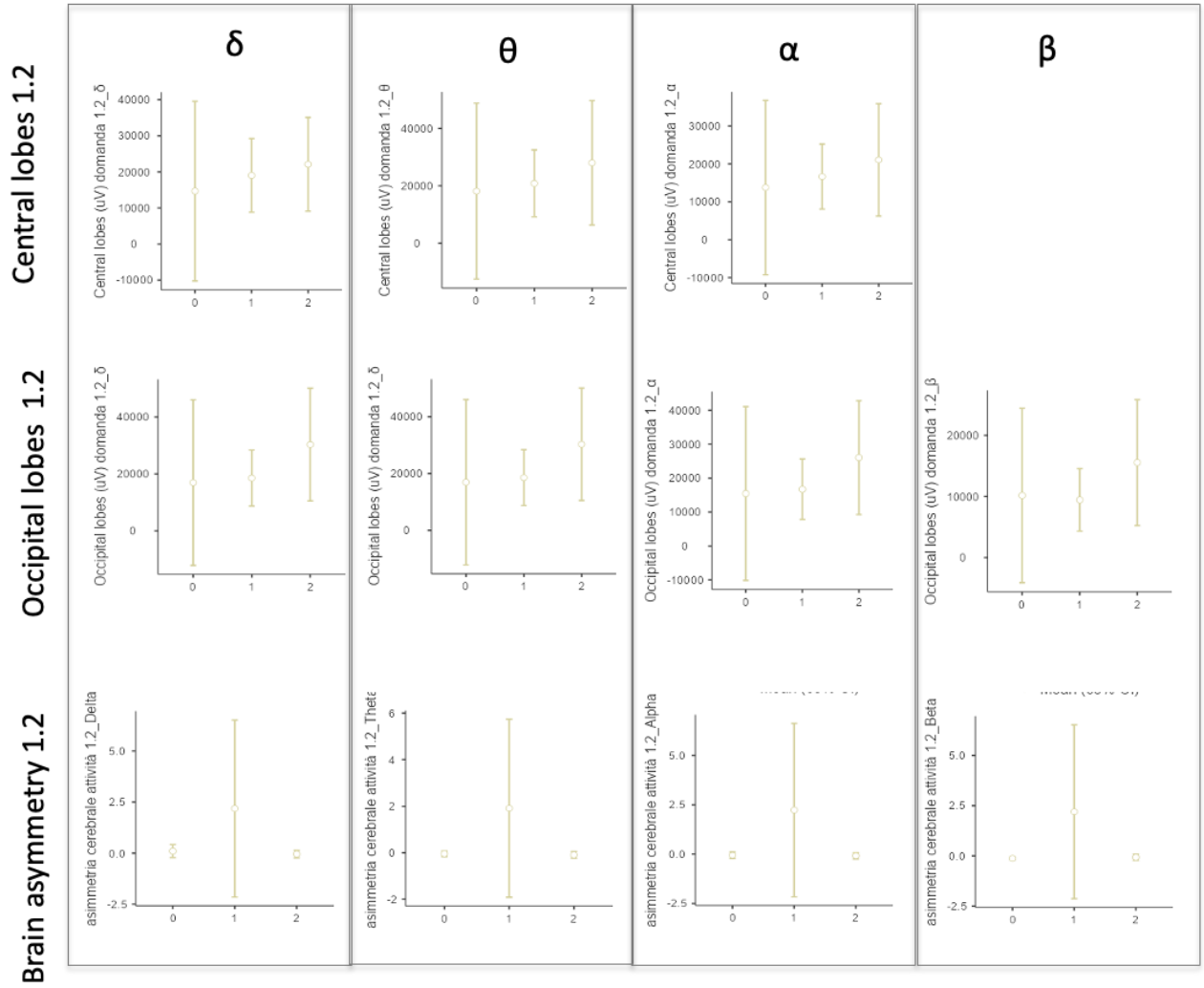

Figure A2. *Measurement of the four waves, in the central and occipital lobes, and hemispheres asymmetry. Task 1.2 Rational vs Emotional.*

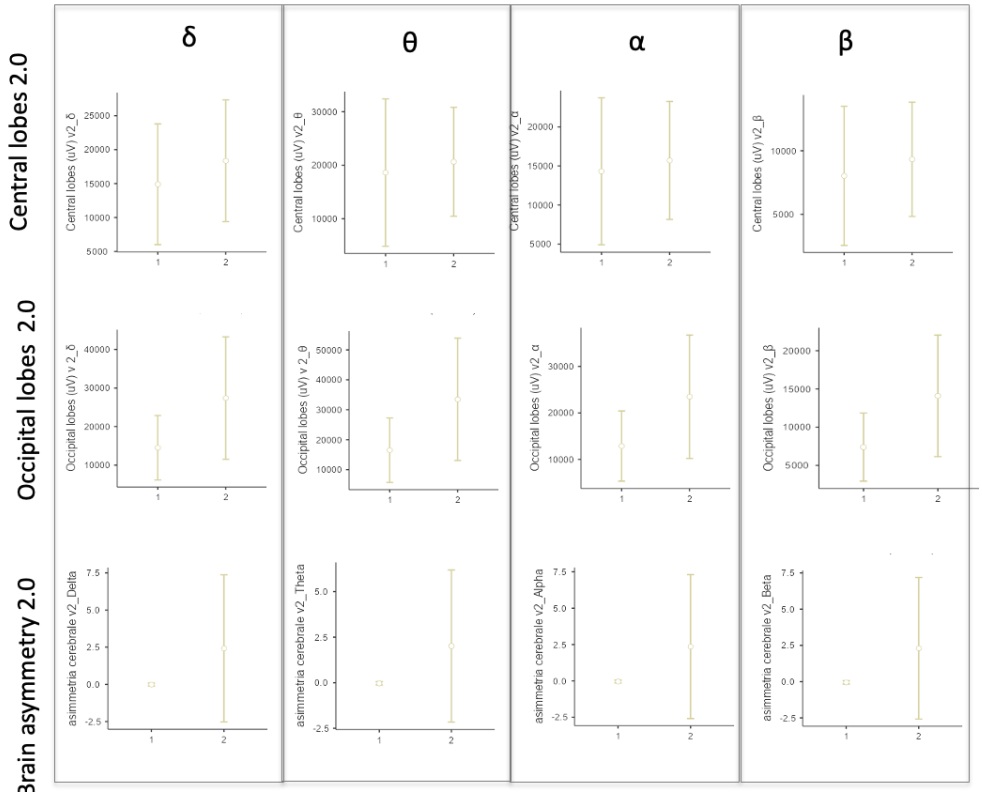

Figure A3. *Measurement of the four waves, in the central and occipital lobes, and hemispheres asymmetry. Task 2.0 Health care vs Administrative workers.*

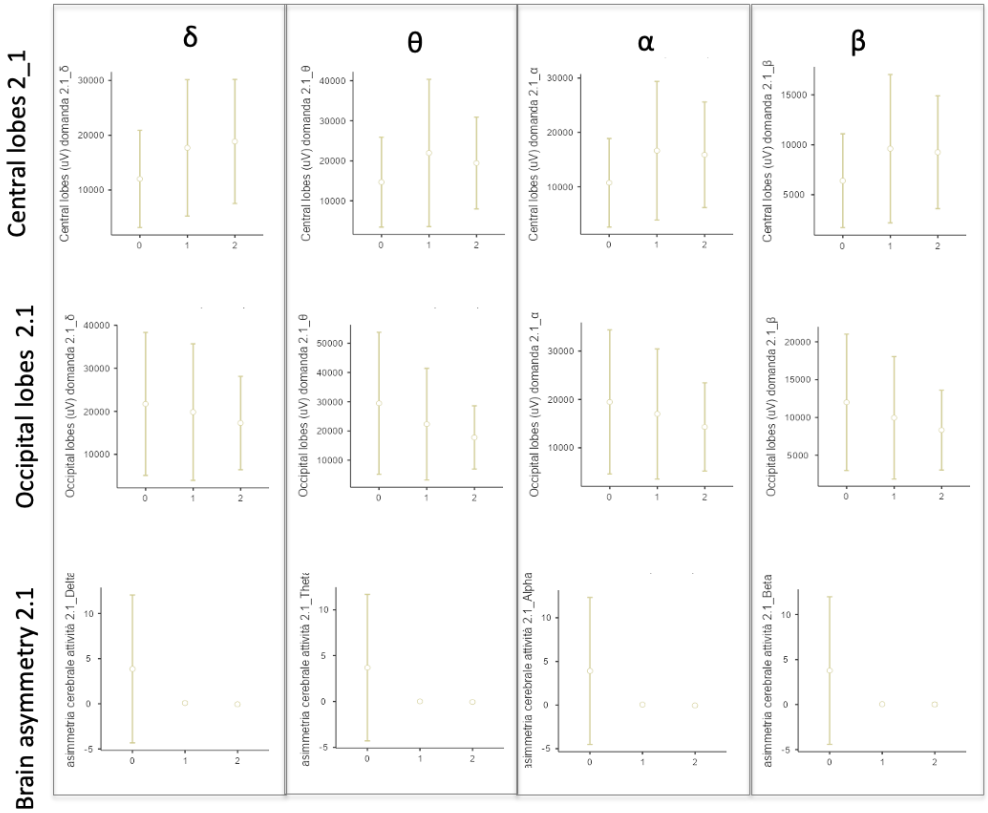

Figure A4. *Measurement of the four waves, in the central and occipital lobes, and hemispheres asymmetry. Task 2.1 Reflective vs Intuitive.*

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