Introduction

Executive functions (EFs) comprise a myriad of different and interdependent cognitive abilities, such as planning, attention, interference control, set-shifting, self-regulation, decision-making and working memory (WM). Briefly, EFs might be defined as the "ability to maintain an appropriate problem set for attainment of future goals". Dysexecutive syndromes might present an array of somewhat distinct behavioral manifestations, ranging from apathetic to disinhibited pictures, as well as one or more cognitive impairments, such as inattention, poor planning abilities, working memory deficits, among others. Different degrees and profiles of dysexecutive syndromes have been described in several neuropsychiatric disorders, such as attention deficit hyperactivity disorder (ADHD), eating disorders, schizophrenia, bipolar disorders, among others. Deficits in EFs may also be found in frontotemporal lobar degeneration and in persons with lesions in prefrontal cortex.

Despite observing clearly functional impairments due to EFs deficits, clinicians often face difficulties to document those deficits using neuropsychological tests, mainly because of many EFs tasks lack of sensitivity. More yet, difficulties in finding impaired performance in neuropsychological tests may be evident not only in cases where dysexecutive syndrome presents with mild impairment, such as ADHD, but also in cases where behavioral changes are severe. As an example of a clinical case of severe behavioral manifestations made famous in the book where patient had normal performance in most neuropsychological tests available at that time, it was necessary to develop a task known as the Iowa Gambling Task (IGT) which

Abstract

Dysexecutive syndromes are often observed in several neuropsychiatric conditions, such as attention deficit hyperactivity disorder (ADHD), traumatic brain injuries (TBI) or schizophrenia, and usually associate with significant impairments, including familial, academic and professional areas. The present paper aims at presenting three cases of executive functions (EFs) deficits where despite having normal IQ, all subjects exhibit significant functional and social impairment. The first case describes a young woman who suffered a TBI and her complaints relates to difficulties in memory for new material, apathy, less persistency and initiative. The second case is about a middle-age woman facing problems since kindergarten and with unsuccessful treatments and no formal diagnosis. In this case, collateral report suggests the presence of planning difficulties, some antisocial behavior, delay gratification aversion, poor activation and time estimation deficits. The last case refers to a middle-age man, evaluated after a severe TBI following a car accident. He presented some behavioral changes, such as disinhibition, lack of persistency and inattentive deficits that occur in a more severe level than presented during his childhood, despite having normal performance in tests of EFs. The evaluation of (developmental or acquired) EF deficits might be extremely important for providing adequate therapeutic approach in order to decrease related impairments in everyday activities.

Keywords: Neuropsychology, executive functions, TBI, personality.

Resumo

Síndromes disexecutivas podem ser observadas em diversas condições neuropsiquiátricas, como transtorno do déficit de atenção e hiperatividade (TDAH), traumatismos cranioencefálicos (TCE) ou esquizofrenia, e usualmente associam-se a significativos comprometimentos, incluindo familiar, acadêmico e profissional. O objetivo do presente estudo é apresentar três casos de disfunções executivas, nos quais, embora todos os pacientes tenham QI dentro dos limites da normalidade, existe significativo comprometimento social e ocupacional. O primeiro caso apresenta uma jovem que sofreu TCE, com queixas de dificuldades de memória para material novo, além de apatia e diminuição de iniciativa e persistência. O segundo caso versa sobre uma mulher que apresenta problemas desde a educação infantil, com histórico de tratamentos ineficazes e nenhum diagnóstico formal. Segundo relato de informante colateral, há déficits de planejamento, comportamentos anti-sociais, aversão a gratificações tardias e dificuldades de estimativa do tempo. O último caso refere-se a indivíduo do sexo masculino, avaliado depois de grave TCE após acidente de carro. Há relato de mudança de comportamento com desinibição, diminuição da persistência e desatenção, relatadas como mais graves do que as apresentadas durante a infância, apesar de desempenho normal em testes de funções executivas. A avaliação de disfunções executivas (do desenvolvimento ou adquiridas) pode ser de extrema importância para servir como base de tratamento visando à diminuição de comprometimentos nas atividades cotidianas.

Palavras-chave: Neuropsicologia, funções executivas, TBI, personalidade.
intended to evaluate decision making ability, strongly related to 
cognitive impulsivity due to non-planning\textsuperscript{13}, to demonstrate patient's 
cognitive impairment. Considering the heterogeneity of clinical outcomes 
after prefrontal lobe lesions or abnormal developmental course, some authors emphasizes the division between "cold" and "hot" components of EFs\textsuperscript{14}. The former EFs component is related to the 
dorsolateral prefrontal network and encompasses mechanistic 
cognitive abilities (e.g. planning, problem-solving, working memory abstract reasoning). The latter component are related to orbitofrontal 
prefrontal network and evokes functions such as interpersonal and 
social behavior, real life decision-making and the emotional regula-
tion during social interaction.

Present paper presents three cases of EFs deficits: 1) a case of ac-
quired EFs deficits due to TBI; 2) a case of developmental EFs deficits 
in the absence of neuropsychiatric disorders; 3) a case of acquired EFs 
deficits due to TBI overlapping a developmental dysexecutive syndro-
me due to ADHD. In all cases subjects faced significant impairment in 
everyday activities despite having IQ within normal ranges. 

Injuries in prefrontal cortices rarely associate with motor, sen-
sorial or language impairments, but may occur with functional and 
social-occupational impairments. Different areas of prefrontal cortex 
have been correlated to EFs, cognitive impulsivity being particularly 
linked to orbitofrontal and ventromedial areas\textsuperscript{15}. TBI is one of the 
most common reasons of referral to neuropsychological evaluation 
services in our country, mainly after car accidents\textsuperscript{16}. Some cases of 
TBI also present impaired EFs deficits with personality changes (for example, Mattos et al \textsuperscript{17}). Also, some individuals might have 
developmental type of EFs deficits despite not having established 
psychiatric or neurological conditions.

**Case 1 – Acquired EFs deficits after traumatic brain injury**

CM, a 19 year old woman, single, right-handed, undergraduate stu-
dent (Engineering), was born in Rio de Janeiro, Brazil, was referred to 
neuropsychological evaluation by her neurologist. Her parents 
reported she always had excellent academic performance. CM was 
described as an organized and persistent person, with no learning or 
attention problems.

Two years before neuropsychological evaluation, CM suffered a 
TBI when hit by a bus while crossing a street. She had lost conscious-
ness and was hospitalized with mental confusion. CM had presented 
anterograde amnesia that lasted for a few months. Her major current 
complaint was a severe impairment in her academic performance. 
According to her report, she was unable to study as many hours as 
before and was also unable to pay attention while reading or studying. 
She also reported being unable to memorize whatever she studied, as 
before. Upon questioning, her mother also reported that she was 
less persistent in her homework and also had less initiative to do 
things she used to. Some behavioral changes were also reported after 
TBI: some degree of apathy, a decrease of emotional responses and 
mood lability. Parents reported that CM was presenting some social 
isolation. She took an RMI that suggested diffuse axonal injury. 

Neuropsychological assessment results were: WAIS\textsuperscript{®}-III (Wechs-
ler Adult Intelligence Scale\textsuperscript{®}, Third Edition) revealed global cognitive 
ability within normal range, with global IQ = 108. Verbal abilities 
were higher than non-verbal ones (indexes were 112 and 102, res-
pectively). Performance on CPT-II (Continuous Performance Test) 
demonstrated an impaired sustained attention index due to variability 
in reaction time when comparing blocks and also changes in inter-
stimulus interval (ISI) (see Table 1); CM performance on attention 
tasks that did not demand sustaining attention for a larger period of 
time (Stroop Test) was unimpaired however. CM demonstrated defi-
cits in memory tests, with impaired acquisition (abnormal learning 
slope), despite preserved performance on retention along time. Rey 
Complex Figure Test was impaired, suggesting difficulties to develop 
visual learning strategies. IGT task performance revealed a negative 
net score and absence of a learning slope. Other EFs tests which 
did not demand emotional decisions (such as IGT) were normal or 
slight impaired. The performance on tests of BADS (Behavioral 
Assessment of the Dysexecutive Syndrome) battery (evaluating 
planning abilities, self-monitoring and time estimation) and WCST 
was considered fair. Working memory abilities were unimpaired on 
Digit Span (both forward and backward), Number-letter and Spatial 
Span. In summary, her neuropsychological profile demonstrated 
deficits in sustained attention and learning strategies which could 
explain her complaints concerning academic impairment. We also 
only applied semi-structured interview Mini-Plus\textsuperscript{13}, but she did not fill 
criteria for any psychiatric disorder.

**Case 2 – Developmental severe EFs deficits**

MO, a 34 year old woman, single, right-handed, graduated in Tou-
rism, born in Salvador, Brazil, was referred to neuropsychological 
examination. Academic impairment is described as being present 
since kindergarten. She has been treated with different professio-

nals, including psychotherapists and physicians (neurologists and 
psychiatrists) since she was 9 years old. Her mother reported a 
normal pregnancy. Delivery occurred at nine months; although no 
obstetric problems were reported, forceps were used then. Her first 
evaluation occurred when she was 11 years old; a speech therapist, 
suggested a possible diagnosis of reading disorder (RD). Genetic 
testing (cariotype) was normal although her parents were referred 
to many different health as well as education professionals, a definite 
diagnosis was never done and many untreatable treatments proved 
unsuccessful. She was submitted to a MRI when she was 32, with 
normal results.

With extra-help after many academic failures throughout school 
she finally entered college (Tourism). By the time of her neuropsy-
chological evaluation, MO was working in Salvador, Bahia, in a team 
dedicated to alphabetize individuals from low socioeconomic class. 
According to her family, she was facing several problems and being 
required to improve her performance by the team coordinator.

Her mother reported that MO presented planning difficulties, 
which made her dependent of friends and relatives. She usually 
spends all her money she was given for the whole month, often at 
the first days or weeks, without being worried of future consequences; 
the same happened with her pre-paid mobile phone, when credits were 
entirely spent in a very short time. According to her mother, MO 
had to be supervised by friends even at the beach, because she would 
not control the time spent under the sun and would frequently have 
severe sunburns. Besides being unemployed and in need of income, 
she lost a good job opportunity because she did not want to interrupt 
a trip to a nearby beach city. Sexual relationships follow the same 
pattern previously described: MO was not worried about sexually 
transmitted diseases; she reported been infected with HPV. She also 
got pregnant twice, and had abortions – in one of the pregnancies she 
decided to take abortive medicines and had an hemorrhage. Parents 
also reported some antisocial behavior: she had already stolen money 
from her grandmother, as well as some precious objects from her 
family in order to sell and make some cash. It is noteworthy that all 
those behaviors were invariably associated to specific events (such as 
trips, etc) that would demand some money that she did not have at 
that moment. Even when she was looking for a job, MO presented a 
pattern of an aversion to any delay gratification; her acts seemed to 
be only guided by immediate reinforcements, e.g., once her parents 
quitted giving her money in order to stimulate her looking for a job; 
as consequence, she stole her mother's checkbook. Time estimation 
seemed to be impaired: she was not able to predict how much time it 
would take to arrive at a certain place; as consequence of such deficit, 
she was ran over more than once while crossing a street and relatives 
were often worrying about this. Her mother reported difficulties to 
avtivate herself independently, others must often tell her what to do; 
she usually slept 14 hours a day. At the time of neuropsychological 
examination, she was not taking any medication and was not under 
any treatment.

Neuropsychological assessment results: MO revealed to be 
worried regarding her performance on tests; she eventually cried 
when performing a test she considered to be presenting impai-

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Stroop Test was also below expected, suggesting deficits in control inhibition and attention. IGT task performance revealed a negative net score and absence of a learning slope. Most of choices were from disadvantageous card decks, which reflected decision making based on immediate reinforcement. Formal language evaluation did not suggest diagnoses of reading or writing disorder, as well as SLI (specific language impairment). She reported some significant depressive symptoms, had high levels of social anxiety and reported alcohol abuse in a semi-structured interview (Mini-Plus). Results are summarized on tables 1 and 2.

### Case 3 – Overlap of EFs deficits despite normal psychometrically performance

RC, a 29 year old man, single, right-handed, born in Rio de Janeiro city, Brazil, graduated in Engineering, was referred to neuropsychological evaluation by his psychiatrist. He had a car accident five years ago, with a severe TBI with brain mass loss, spending several days in coma at an intensive care unit. After the coma, he developed obsessive-compulsive symptoms (a ritual of hitting fingers followed by walking around circles); he also presented binge eating episodes that remitted after some weeks.

### Table 1. Performance on memory, executive functions and attention tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Case 1 CM</th>
<th>Classification</th>
<th>Case 2 MO</th>
<th>Classification</th>
<th>Case 3 RC</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit Span</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Span forward</td>
<td>7</td>
<td>Above-average</td>
<td>5</td>
<td>Borderline</td>
<td>5</td>
<td>Low-average</td>
</tr>
<tr>
<td>- Span backward</td>
<td>6</td>
<td></td>
<td>3</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Stroop CW</td>
<td>112</td>
<td>Normal</td>
<td>82</td>
<td>Impaired</td>
<td>95</td>
<td>Impaired</td>
</tr>
<tr>
<td>Rey’s complex figure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Copy</td>
<td>36</td>
<td>Normal</td>
<td>34</td>
<td>Normal</td>
<td>36</td>
<td>Normal</td>
</tr>
<tr>
<td>- Retrieval</td>
<td>20.5</td>
<td>Impaired</td>
<td>23</td>
<td>Normal</td>
<td>28</td>
<td>Normal</td>
</tr>
<tr>
<td>RAVLT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- A1</td>
<td>6</td>
<td>Normal</td>
<td>6</td>
<td>Normal</td>
<td>8</td>
<td>Normal</td>
</tr>
<tr>
<td>- A5</td>
<td>10</td>
<td>Impaired</td>
<td>12</td>
<td>Normal</td>
<td>13</td>
<td>Normal</td>
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<tr>
<td>- Proactive interference</td>
<td>1</td>
<td>Normal</td>
<td>0.83</td>
<td>Normal</td>
<td>1</td>
<td>Normal</td>
</tr>
<tr>
<td>- Retroactive interference</td>
<td>0.4</td>
<td>Impaired</td>
<td>0.91</td>
<td>Normal</td>
<td>0.84</td>
<td>Normal</td>
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<tr>
<td>- Forget speed</td>
<td>1</td>
<td>Normal</td>
<td>1</td>
<td>Normal</td>
<td>0.90</td>
<td>Normal</td>
</tr>
<tr>
<td>- Recognition memory</td>
<td>12</td>
<td>Impaired</td>
<td>14</td>
<td>Normal</td>
<td>14</td>
<td>Normal</td>
</tr>
<tr>
<td>Word fluency – phonological</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- F</td>
<td>11</td>
<td>Impaired</td>
<td>9</td>
<td>Impaired</td>
<td>9</td>
<td>Impaired</td>
</tr>
<tr>
<td>- A</td>
<td>14</td>
<td>Impaired</td>
<td>6</td>
<td>Impaired</td>
<td>6</td>
<td>Impaired</td>
</tr>
<tr>
<td>- S</td>
<td>13</td>
<td>Impaired</td>
<td>13</td>
<td>Impaired</td>
<td>4</td>
<td>Impaired</td>
</tr>
<tr>
<td>Word fluency – semantics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Animals</td>
<td>24</td>
<td>Normal</td>
<td>19</td>
<td>Normal</td>
<td>17</td>
<td>Normal</td>
</tr>
<tr>
<td>- Fruits</td>
<td>18</td>
<td>Normal</td>
<td>12</td>
<td>Impaired</td>
<td>17</td>
<td>Normal</td>
</tr>
<tr>
<td>CPT-II Omissions</td>
<td>2</td>
<td>Normal</td>
<td>Not administered</td>
<td>0</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>CPT-II Commissions</td>
<td>6</td>
<td>Normal</td>
<td>Not administered</td>
<td>16</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>CPT-II Hit RT</td>
<td>460,36</td>
<td>Impaired</td>
<td>Not administered</td>
<td>358,85</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>CPT-II Hit RT Std. Error</td>
<td>8,08</td>
<td>Impaired</td>
<td>Not administered</td>
<td>3,41</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>CPT-II Variability</td>
<td>11,11</td>
<td>Impaired</td>
<td>Not administered</td>
<td>4,28</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>Detectability (d’)</td>
<td>0,53</td>
<td>Normal</td>
<td>Not administered</td>
<td>0,42</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>CPT-II RT ISI Change</td>
<td>0,13</td>
<td>Impaired</td>
<td>Not administered</td>
<td>0,04</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>CPT-II SE ISI Change</td>
<td>0,12</td>
<td>Impaired</td>
<td>Not administered</td>
<td>-0,02</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>Iowa Gambling Task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Net score</td>
<td>-22</td>
<td>Impaired</td>
<td>-24</td>
<td>Impaired</td>
<td>-2</td>
<td>Low-average</td>
</tr>
</tbody>
</table>

**Digit Span:** verbal working memory; **Stroop:** attention and inhibitory control; **Rey’s complex figure:** constructional praxia and visual memory; **RAVLT:** verbal memory; **Word fluency:** verbal fluency; **CPT-II:** sustained attention and inhibitory control; **Iowa Gambling Task:** decision making.

**Figure 1.** Description of card selection (advantageous – disadvantageous) for each block of 20 choices.

Stroop Test was also below expected, suggesting deficits in control inhibition and attention. IGT task performance revealed a negative net score and absence of a learning slope. Most of choices were from disadvantageous card decks, which reflected decision making based on immediate reinforcement. Formal language evaluation did not suggest diagnoses of reading or writing disorder, as well as SLI (specific language impairment). She reported some significant depressive symptoms, had high levels of social anxiety and reported alcohol abuse in a semi-structured interview (Mini-Plus). Results are summarized on tables 1 and 2.
His mother reported some behavioral changes after the accident: RC was previously described as a shy man who did not speak much at social occasions; nowadays he talks excessively and with persons he just met at the street, often saying inappropriate things, and often telling inappropriate jokes. He had previous Cannabis and cocaine abuse, which resumed after recovering from the car accident. Along the first interview, he started laughing while his mother described his behavioral changes. The examinee repeatedly said “I lost left frontal lobe”, explaining that this would be the area of “perceiving other people feelings”, something he was told by his psychiatrist. RC was on treatment for drug addiction at the time of the evaluation, although he was prompted to return to his activities at the family company, he never resumed his former degree of professional performance, since he was prompted to return to his activities at the family company, he never resumed his former degree of professional performance, since then he did not seem to perceive when he was wrong and usually blamed others (the secretary, the purchaser, the office-boy, etc.) for mistakes he had made. He became more inattentive, showing a lack of persistence, giving up projects without concluding them, and sleeping much more hours than usual. His mother’s report suggested a clear impairment in everyday activities, performance in EFs tests was within normal ranges, including IGT (see Table 1). Memory acquisition, retention and recall were considered normal. Along evaluation, RC showed good effort trying to solve tasks, but he lost some sessions because of being late. Neuropsychological profile is described on tables 1 and 2.

### Discussion

It is well known that EF deficits might occur due to a wide range of etiologies, such as developmental (e.g., ADHD) or acquired, such as TBI or neurodegenerative diseases. Also, as previous mentioned, EF deficits might be divided in “hot” and “cold” aspects, the first referring to functions that comprise interpersonal and social behavior, real life decision-making abilities, whereas the latter ones are related to mechanistic abilities such as planning, working memory, problem-solving among others. Thus, heterogeneity of dysexecutive syndromes demand a detailed neuropsychological evaluation, that are better characterized when describing case-reports.

The three cases share some similarities. All individuals had significant impairment in everyday life, despite all of them having normal IQ, varying from low-average (as in the case of developmental EFs deficits) to average. Considering Word Fluency Tasks, the three cases had impairment in phonological but not in semantic task. There are several evidences of a double dissociation between phonological and semantic word fluency tasks. The former is frequently associated to the left prefrontal and the latter with left temporal lobe networks. Therefore, these results reinforce the presence of prefrontal impairments and EF impairment in all cases. However, EF deficits had different profiles. In the cases of MO and RC are marked by deficits of inhibition where they have some inappropriate behaviors – which could be features of hot EF deficits –, whereas CM was more prone to show learning problems and some apathy. It is noteworthy that despite having significant impairment in everyday activities, performance in EFs tests was considered normal. Results of RC might be partially explained by normal performance on CPT-II. Performance on all measures of EFs was within normal ranges, including IGT (see Table 1). Memory acquisition, retention and recall were considered normal. Along evaluation, RC showed good effort trying to solve tasks, but he lost some sessions because of being late. Neuropsychological profile is described on tables 1 and 2.

### Table 2. Performance on tests of WAIS-III battery

<table>
<thead>
<tr>
<th>Test/Index</th>
<th>Case 1 CM</th>
<th>Case 2 MO</th>
<th>Case 3 RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full scale IQ</td>
<td>108 Average</td>
<td>85 Low-average</td>
<td>94 Average</td>
</tr>
<tr>
<td>Verbal scale IQ</td>
<td>112 High-average</td>
<td>81 Low-average</td>
<td>94 Average</td>
</tr>
<tr>
<td>Performance IQ</td>
<td>102 Average</td>
<td>91 Average</td>
<td>92 Average</td>
</tr>
<tr>
<td>Verbal comprehension</td>
<td>112 High-average</td>
<td>96 Average</td>
<td>98 Average</td>
</tr>
<tr>
<td>Perceptual organization</td>
<td>109 Average</td>
<td>97 Average</td>
<td>93 Average</td>
</tr>
<tr>
<td>Processing speed</td>
<td>111 High-average</td>
<td>73 Borderline</td>
<td>93 Average</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>75 High-average</td>
<td>25 Average</td>
<td>50 Average</td>
</tr>
<tr>
<td>Similarities</td>
<td>75 High-average</td>
<td>50 Average</td>
<td>50 Average</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>63 Average</td>
<td>2 Borderline</td>
<td>50 Average</td>
</tr>
<tr>
<td>Digit Span</td>
<td>75 High-average</td>
<td>5 Borderline</td>
<td>16 Low-average</td>
</tr>
<tr>
<td>Information</td>
<td>84 High-average</td>
<td>50 Average</td>
<td>37 Average</td>
</tr>
<tr>
<td>Comprehension</td>
<td>- -</td>
<td>2 Borderline</td>
<td>- -</td>
</tr>
<tr>
<td>Picture completion</td>
<td>25 Average</td>
<td>25 Average</td>
<td>37 Average</td>
</tr>
<tr>
<td>Coding</td>
<td>25 Average</td>
<td>5 Borderline</td>
<td>50 Average</td>
</tr>
<tr>
<td>Block Design</td>
<td>91 Superior</td>
<td>16 Low-average</td>
<td>37 Average</td>
</tr>
<tr>
<td>Matrix reasoning</td>
<td>84 High-average</td>
<td>91 Superior</td>
<td>37 Average</td>
</tr>
<tr>
<td>Pic arrangement</td>
<td>37 Average</td>
<td>50 Average</td>
<td>25 Average</td>
</tr>
<tr>
<td>Symbol search</td>
<td>16 Low-average</td>
<td>5 Borderline</td>
<td>25 Average</td>
</tr>
</tbody>
</table>

**Vocabulary:** expressive language; **Similarities:** verbal abstract reasoning; **Arithmetic:** mathematical skills; **Digit Span:** verbal working memory; **Information:** general knowledge; **Comprehension:** receptive language; **Picture completion:** visual perceptual skill; **Coding:** visual-motor dexterity; **Block design:** visual-constructional skills; **Matrix reasoning:** abstract reasoning; **Pic arrangement:** logical sequential reasoning; **Symbol search:** visual-motor dexterity and processing speed.
by the lack of sensitivity of neuropsychological tests and also by 
his high premorbid level, given that his performance in everyday 
activities – including interpersonal relationships – was described 
as completely impaired.

Bechara and Damasio\textsuperscript{11} have studied performance of substance 
dependent individuals (SDI) on IGT, combining the performances 
with skin conductance response (SCR). They found that some of the 
SDI that had impaired IGT were not able to generate anticipatory 
SCRs before attempting a risk choice (decks A and B), despite present-
ning normal SCRs after being punished with loss of money. Moreover, 
those individuals’ presented normal acquisition of conditioned SCR to 
an aversive loud sound. The authors suggested that this pattern 
would be associated with impairment of activating somatic states 
that would be linked to a dysfunctional VM cortex. In one of the cases 
(MO), there was report of some inappropriate behaviors, such as 
estealing her grandmother money or precious objects from her family 
in order to make cash and travel; it seems reasonable to assume a 
similar pattern of functioning of MO, given that she showed several 
impulsive choices in her life, which could reflect impaired ability of 
anticipating negative feelings of future consequences. The myopia for 
the future of MO (see her impaired performance on IGT in table 1) 
is similar to that found in SDI individuals; difficulties to feel negative 
outcome of the choices – insensitivity to future consequences – with 
preserved capacity to feel present negative feelings that lead to a 
depressive syndrome that was self-report in questionnaires. In this 
case, MO could not go back home from a trip in order to make part 
of a job interview – insensitivity to future consequences – despite of 
future depressive symptoms due to status of unemployment. This is 
a classical example of “hot” EFs deficits being marked by impaired 
decision making.

In case 3, RC has a previously history of ADHD with substance use 
disorder; such comorbidity might be associated to some of his 
EFs deficits. Although a dysexecutive syndrome is neither necessary 
nor sufficient for the diagnosis of ADHD, such patients presenting 
with poor performances in EFs tests are more prone to functional 
impairment in different areas\textsuperscript{16}. Impulsiveness is closely associated 
to the risk traffic behaviors\textsuperscript{26}, and as pointed by, Biederman et al.\textsuperscript{23} have also demonstrated that adults with ADHD plus EFs 
deficits are at higher risks of having automobile accidents than control 
subjects and ADHD individuals with normal performances at EFs 
tasks; given that car accidents are the main reason of TBI in Brazil, 
it seems reasonable to considerate that those subjects are at higher 
risks of suffering a TBI. Also, rates of substance disorders are higher 
among ADHD subjects in comparison to control individuals. Also, as 
previously mentioned Bechara et al.\textsuperscript{11} have suggested that impaired 
decision making – a feature of hot EFs – may be a risk factor to the 
development of substance disorders, which also increase risks of 
having automobile accidents.

Case 1 described a young woman with good academic perfor-
mance that suffered a TBI, with cognitive and behavioral changes, 
although the latter ones have been less prominent. She presented 
some difficulties following accomplishing university demands, 
except having a normal IQ. Some of the difficulties might be due to 
sustained attention deficits, EFs deficits, and primary memory 
deficit – this last deficit was not found among the other cases. 
Mattos et al.\textsuperscript{16} documented a case of behavioral changes after TBI 
similar to this case, in an individual with no history of psychiatric 
disorder or EFs deficits who became mildly apathetic. The case 
reported by Mattos et al.\textsuperscript{16} revealed neuropsychological impair-
ments others than only EFs deficits, such as long-term memory 
loss and visual-motor dexterity. Lack of persistence was described 
in the case of Mattos; CM case is also characterized by “hot” EFs 
deficits, such as pattern of choices based on immediate reward 
(see IGT), which indicates cognitive impulsivity, despite having 
also some apathy.

Considering the assessment of “hot” and “cold” EFs components, 
all cases described here present deficits both in real life decision 
making test and in those tasks that evolve more mechanicistic and 
logically based cognition – with the exception of RC case. Together 
these deficits are strongly related to the reported impairments in 
day-life activities.

\section*{Conclusion}

Deficits in EFs might associate with significant impairment in 
everyday activities, including professional and academic areas. 
Identification of those deficits and its severity may be extremely 
important to determine therapeutic approach and independency level 
that might be reached by individual. Also, determining and 
treating primary diagnosis that course with those deficits may pre-
vent negative consequences and improve academic and professional 
performance.

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