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Défices cognitivos em pacientes com depressão unipolar: Influência das variáveis idade, género e história anterior de tentativas de suicídio

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Dedicatória

À memória da minha mãe, que eu amo muito e que muita falta me tem feito nos últimos meses.

Aos meus dois filhos, Ricardo e Sofia, que eu amo e adoro, e que pelos quais oriento toda a minha vida.

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Resumo

A depressão afeta mundialmente cerca de 350 milhões de pessoas, sendo considerada a principal causa de incapacidade a nível mundial, comprometendo seriamente a qualidade de vida, apresentado este estado afetivo um elevado risco de suicídio para estes doentes. No que se refere ao suicídio, o mesmo pode ser considerado um fenómeno global e um grave problema de saúde pública, responsável por mais de 800 mil mortes anualmente. Défices nas funções executivas, na memória e na velocidade motora são comuns na depressão e ainda mais exacerbados em indivíduos depressivos suicidas.

Torna-se, por isso, essencial generalizar o recurso a meios complementares de diagnóstico, como os testes neuropsicológicos que medem a capacidade de decisão, de mudança de foco de atenção, de planeamento, de inibição de resposta e o controlo inibitório, entre outros, que, para além de fornecerem informações importantes para um correto diagnóstico e tratamento da depressão, propiciam estudar as dinâmicas subjacentes aos comportamentos suicidas, com vista a encontrar marcadores cognitivos que permitam identificar casos de maior risco visando o seu controlo e prevenção.

Em Portugal, o recurso a medidas neuropsicológicas ainda não se encontra generalizado, por isso, um dos objetivos deste trabalho passou por validar um conjunto de testes computorizados de um software de livre acesso da Psychology Experiment Building Language (PEBL) junto da população portuguesa – a saber, *Finger Tapping Task*, *Wisconsin Card Sorting Test*, Torre de Londres, *Iowa Gambling Task*, *Victoria Stroop Task* e *Go/No-go* –, procurando simultaneamente estudar amostras de depressivos unipolares não-psicóticos.

Outro objetivo consistiu em aplicar esses testes em pacientes suicidas com igual diagnóstico, procurando encontrar marcadores cognitivos que os diferenciassem de depressivos não suicidas, tendo-se corroborado a existência de défices nas amostras depressivas, com uma alteração significativa da inibição de resposta nos sujeitos suicidas face aos não suicidas e face aos controlo saudáveis.

Palavras-chave: Depressão Unipolar Não-Psicótica; Suicídio; Défices Cognitivos; Comportamentos Suicidas; Testes Neuropsicológicos; Dados Normativos.

Abstract

Approximately 350 million people worldwide are affected with depression. It is the leading cause of disability, compromising severely life quality, and corresponds to one of the highest risks for suicide. Suicide is a global phenomenon and a grave public health issue responsible for more than 800.000 deaths every year. Impairments in executive functions, memory and motor speed are common in depression and happen to be even more acute among depressive suicidal patients.

It becomes therefore essential to bring into common use supplementary diagnostic recourses, such as neuropsychological tests that measure decision-making, set-shifting, planning, inhibitory response and inhibitory control, among others. Besides providing important information for a correct diagnosis and treatment of depression, these measures propitiate studying, among depressed suicide attempters, processes underlying suicidal behavior in order to find cognitive markers that could help indentify higher-risk cases aiming for their control and prevention.

In Portugal, the use of neuropsychological measures is not yet widespread, so, one of this study's objectives was validating an array of computerized tests from Psychology Experiment Building Language (PEBL), a free software, for Portuguese population – namely, Finger Tapping Task, Wisconsin Card Sorting Test, Tower of London, Iowa Gambling Task, Victoria Stroop Task and Go/No-go –, aiming simultaneously at studying samples comprising non-psychotic unipolar depressed subjects.

Other objective consisted in reapplying those tests to matching suicidal patients, trying to find cognitive markers that could possibly allow distinguishing them from depressed non-attempters. We corroborated then the presence of impairments in depressive samples, with a significant deficit of response inhibition in suicidal subjects compared to non-suicidal and healthy control.

Keywords: Non-Psychotic Unipolar Depression, Suicide, Cognitive Deficits, Suicidal Behavior, Neuropsychological Tests; Normative Data.

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Prólogo

A ideia da presente investigação surgiu no seguimento de inúmeras intervenções psicoterapêuticas com pacientes suicidas em contexto de crise, de internamento hospitalar ou de acompanhamento em ambulatório, realizadas no Departamento de Psiquiatria e Saúde Mental do Centro Hospitalar do Algarve, Unidade de Faro, e teve como base a seguinte afirmação:

"Drº, eu não queria morrer, não sei porque fiz isto" (sic) *Maria* (nome fictício)

O *"isto"* foi uma ingestão medicamentosa, algo nunca tentado por "*Maria"*, e que me fez procurar uma explicação para um comportamento inesperado, que ocorreu na vida de uma mulher licenciada, com sucesso profissional, casada, com dois filhos e bom suporte familiar e social. Clinicamente a "*Maria"* não apresentava perturbações de personalidade, não existia história de acompanhamento psiquiátrico, negava consumo de álcool ou drogas, *"eu nem fumo Dr."* (sic), e não tinha diagnóstico de doença neurológica. Durante o internamento foi realizada uma ressonância magnética que não revelou alterações significativas.

Face a este cenário, conseguiu-se, em equipa, fazer o diagnóstico de perturbação depressiva (primeiro episódio), tendo a tentativa de suicídio sido explicada, nessa altura, pela presença de sintomatologia depressiva. Evidentemente que este não foi o primeiro nem o último caso que acompanhei devido a tentativa de suicídio ou presença de ideação suicida, mas, não sabendo explicar o porquê, ficou-me marcado na memória e frequentemente formulava hipóteses, juntamente com o meu colega de equipa, o médico psiquiatra Eduardo Gonçalves, e não conseguia encontrar uma causa clara para o ocorrido.

Foi com base neste pressuposto que coloquei a hipótese de poder existir uma causa orgânica associada ao comportamento suicida de doentes depressivos, dependente do funcionamento cognitivo, tendo iniciado a pesquisa bibliográfica necessária para a elaboração de um projeto de investigação clínica.

Introdução

Estima-se que mais de 350 milhões de pessoas em todo o mundo sofram de depressão, recaindo a maior incidência sobre o sexo feminino, sendo esta a patologia mais diagnosticada em saúde mental, com uma tendência global de aumento dos diagnósticos, algo preocupante, pois sabe-se que apenas são tratados metade desses doentes (Taube-Schiff & Lau, 2008; World Health Ooganization - WHO, 2015). No que se refere às suas características, a depressão corresponde a uma patologia mental marcada por presença de humor depressivo e perda generalizada de interesse pela vida, podendo os sintomas persistir por um período de tempo que pode oscilar entre semanas, meses ou mesmo vários anos, com influência negativas nas esferas pessoais, sociais e profissionais, representando a maior causa de incapacidade a nível global (American Psychiatric Assocoation - APA, 2013; Dozois & Dobson, 2002; WHO, 2015).

Ao falar de depressão, temos inevitavelmente de falar sobre um dos seus principais sintomas em termos clínicos, o pensamento suicidas, sendo o diagnóstico de depressão e o consumo (excessivo) de álcool, um dos principais fatores de risco de suicídio a nível mundial (Lekka et al., 2006; Schneider et al., 2006; WHO, 2015). Em 2012, o suicídio representou a segunda maior causa de morte entre os 15 e os 29 anos, com um número total de óbitos estimado em oitocentas mil (WHO, 2015). Uma meta-análise conduzida por Arsenault-Lapierre e colegas (2004), focada em estudos que utilizaram o método de autópsia psicológica, mostrou a evidência da presença de doença mental em 87.3% das pessoas que cometeram suicídio, 95% das quais apresentavam indícios de perturbação afetiva.

Ligados aos comportamentos suicidas, comummente designados de crises suicidas, estão normalmente associados processos complexos que podem durar entre poucos minutos a vários meses. A dinâmica desses processos caracteriza-se pelo surgimento e/ou acalento da chamada dor psíquica ou psicológica (Jollant et al., 2011; Keilp et al., 2012b), ou seja, sentimentos dolorosos, e considerados insuportáveis pelo próprio, tais como, culpa ou remorso, vergonha, raiva e rancor, culminando numa extrema desesperança, angústia profunda e desespero, ao ponto de, frequentemente, levarem à ocorrência de pensamentos suicidas que, por vezes, conduzem a uma tentativa de suicídio. Entre as causas conhecidas dessa dinâmica que caracteriza a crise suicida encontram-se

as causas externas ou ambientais, sendo as mais frequentes, a morte de um ente querido, problemas financeiros, a separação ou divórcio, dificuldades sociais e/ou relacionais, isolamento, problemas no trabalho, ser-se vítima de violência ou abusos e discriminação (Jollant et al., 2011; Heikkinen et al., 1994).

Para além de uma visão social e ambiental, no âmbito das neurociências, e focando-se a abordagem em marcadores neuroimagiológicos e neurocognitivos, foi possível apurar que as regiões cerebrais mais diretamente implicadas nos comportamentos suicidas equivalem àquelas que se encontram envolvidas em basicamente todas as funções executivas (Simmonds et al., 2008). Pesquisas no âmbito da cognição vêm, através de testes neuropsicológicos, corroborar as descobertas neuroimagiológicos, desvendando a associação entre défices executivos e comportamentos suicidas. Estes défices executivos são diferentes dos cognitivos comuns na depressão, mas também se encontram presentes nesta, embora não de forma tão acentuada quanto em indivíduos deprimidos com um passado de, pelo menos, uma tentativa de suicídio. Adicionalmente, sugere-se que a ideação suicida, independentemente de existirem tentativas passadas ou não, contribui para um agravamento na qualidade do desempenho executivo (e.g. Westheide et al., 2008).

Com base na literatura, a tese que aqui se apresenta, teve como objetivo aprofundar a investigação com vista ao alargamento do conhecimento acerca dos indicadores físicos de doenças como a depressão, em particular no âmbito das funções executivas, da memória e da velocidade psicomotora, capazes de se constituírem em instrumentos indispensáveis ao seu correto diagnóstico, através da validação, para a população portuguesa, de um conjunto de testes neuropsicológicos. Outro objetivo passou por estudar, com recurso a esses testes, pacientes deprimidos suicidas, comparando-os com sujeitos deprimidos sem história de tentativas de suicídio, a fim de contribuir para o alargamento do conhecimento respeitante às repercussões da conduta suicida no desempenho executivo.

Em Portugal, o recurso a medidas neuropsicológicas auxiliares de diagnóstico ainda não se encontra devidamente generalizado. Por esta razão, optou-se por utilizar um conjunto de testes computorizados da bateria PEBL (Psychology Experiment Building Language; Mueller, 2013), um software livre e de fácil acesso.

Apresentam-se, assim, sete estudos. Os seis primeiros foram dedicados à validação de alguns dos mais importantes testes auxiliares de diagnóstico neuropsicológico associados ao funcionamento executivo e psicomotor, nos quais foram utilizadas amostras de pacientes deprimidos unipolares não psicóticos e grupos de controlo de indivíduos saudáveis, com vista a, por um lado, apresentar dados normativos para a população portuguesa (passíveis de serem usados por clínicos na sua prática clínica quotidiana e por investigadores em estudos futuros) e, por outro, a aferir o desempenho destes pacientes, ao encontro das evidências retiradas da pesquisa científica previamente realizada. Foram tidas em conta as variáveis idade, género e educação. Os testes que constituíram o objeto de cada um dos estudos são (1) o *Finger Tapping Task*, que mede a velocidade psicomotora; (2) o *Wisconsin Card Sorting Test*, que avalia sobretudo a capacidade de mudar o foco de atenção (*set-sifting*); (3) a Torre de Londres, usada para aferir a capacidade de planeamento; (4) o *Iowa Gambling Task*, que mede a capacidade de tomada de decisão; (5) o *Victoria Stroop Task*, que avalia o controlo inibitório e (6) o *Go/No-go* (paradigma "simples"), que mede a resposta inibitória. O sétimo e último artigo, para o qual confluem os anteriores, debruçou-se sobre o tema do suicídio em contextos de depressão e, através do emprego de todos os testes validados nos supramencionados artigos, assim como de outros considerados necessários à prossecução do propósito do estudo (*Trail Making Test* – partes A e B (Cavaco et al., 2008a, 2013b), *Auditory Verbal Learning Test* (Cavaco et al., 2008b) e Teste de Fluência Verbal (Cavaco et al., 2013a). Procurou-se assim comparar o desempenho das funções executivas, da memória e da velocidade psicomotora em pacientes deprimidos unipolares não psicóticos com história anterior de tentativa(s) de suicídio, pacientes deprimidos unipolares não psicóticos sem história de tentativas anteriores de suicídio – nos quais foi controlada a ideação suicida atual –, e grupo de controlo saudável.

A presente tese encontra-se organizada em duas partes, a saber, Enquadramento Teórico e Estudos Empíricos. A primeira parte – Enquadramento Teórico – apresenta a revisão da literatura e divide-se em dois capítulos:

No Capítulo I, dedicado à pesquisa neurofisiológica e neurocognitiva, abordam-se os temas: as funções executivas e os lobos frontais do córtex, nomeadamente, anatomia dos lobos frontais; funções associadas ao córtex pré-frontal dorsolateral; funções associadas ao córtex ventral (córtex orbitofrontal e ventromedial) e importância da ressonância magnética funcional (fMRI) na neuropsicologia.

O Capítulo II incide sobre o tema da depressão e dos comportamentos suicidas, designadamente, prevalência da depressão; critérios de diagnóstico; alterações cognitivas da depressão (unipolar e bipolar); suicídio e alterações cognitivas em pacientes suicidas.

Na segunda parte – Estudos Empíricos –, apresentam-se os objetivos e as questões de investigação e, de seguida, os sete artigos originais, em inglês:

1. *Computerized Finger Tapping Task in adult unipolar depressed patients and healthy subjects: Influence of age, gender, education and hand dominance;*
2. *Executive dysfunction in non-psychotic unipolar depression patients using the Wisconsin (Berg) Card Sorting Test;*
3. *Planning dysfunction in non-psychotic unipolar depressed patients using a computerized version of the Tower of London task;*
4. *Decision-Making in adult unipolar depressed patients and healthy subjects: Significant differences in Net Score and in non-traditional alternative measures;*
5. *Computerized Victoria Stroop Test in adult unipolar depressed patients and healthy subjects: Influence of age and gender;*
6. *Portuguese version of simple Go/No-go Task: Influence of age in attention and response inhibition reaction time;*
7. *The influence of response inhibition in cognitive functioning of non-psychotic unipolar depressed suicide attempters.*

Expõem-se então as conclusões de todo o trabalho empreendido.

Por fim, apresentam-se as referências bibliográficas e os anexos.

PARTE I – ENQUADRAMENTO TEÓRICO

CAPÍTULO I

Funções executivas e os lobos frontais do córtex

O funcionamento executivo refere-se à capacidade de uma pessoa elaborar um conjunto de processos cognitivos que lhe permitem determinar objetivos, formular novas maneiras para os atingir, adaptando-se a várias mudanças ao longo de um determinado percurso, fazendo escolhas e envolvendo-se em comportamentos intencionais orientados para o futuro (Burgess & Alderman, 2003; Suchy, 2009). As funções executivas conferem, assim, uma vantagem evolutiva importante para o ser humano, dando-nos a capacidade de considerar várias opções, selecionar uma resposta específica para um determinado estímulo com base em contextos situacionais, conhecimento previamente adquirido e metas a longo prazo, sendo que os aspetos essenciais destas funções são suportados pelos lobos frontais do cérebro humano (Suchy, 2009).

Os lobos frontais equivalem a uma grande área, representando aproximadamente um terço da superfície cortical do cérebro. Esta área está envolvida, direta e indiretamente, num amplo conjunto de pensamentos humanos, comportamentos e emoções. O funcionamento dos lobos frontais compreende um amplo leque de competências, entre as quais, as competências motoras simples (ambas, finas e grossas), as competências motoras complexas, a inibição das competências motoras, as competências motoras automáticas, bem como as competências executivas. Estas funções incluem a atenção, o raciocínio lógico abstrato, o julgamento, a resolução de problemas, a criatividade, a regulação emocional, o controlo de impulso, a inibição de resposta, a tomada de decisão e a consciência do outro (Scott & Schoenberg, 2011; Stirling, 2005).

Anatomia dos lobos frontais

No que se refere à conceção mais tradicional da divisão dos lobos frontais, estes podem ser divididos em três grandes categorias: (1) o córtex motor primário, (2) o córtex

pré-motor, ou secundário, e a área motora suplementar, e (3) córtex pré-frontal (Figura 1) (Scott & Schoenberg, 2011). Quanto ao córtex pré-frontal, localizado antes do córtex motor e pré-motor, e área motora suplementar, este pode dividir-se em três domínios funcionais (1) o córtex pré-frontal dorsolateral, (2) o córtex pré-frontal superomedial (que inclui o giro cingulado anterior), e (3) córtex ventral ou inferior, que pode ser dividido em orbitofrontal e ventromedial. Nos últimos anos, a zona anterior dos lobos frontais, conhecida como fronto-polar (que inclui parte do córtex dorsolateral e do córtex ventral), tem recebido alguma atenção devido à sua relação com a moralidade, a empatia e a integração de ordens superiores das funções executivas (Suchy, 2009).

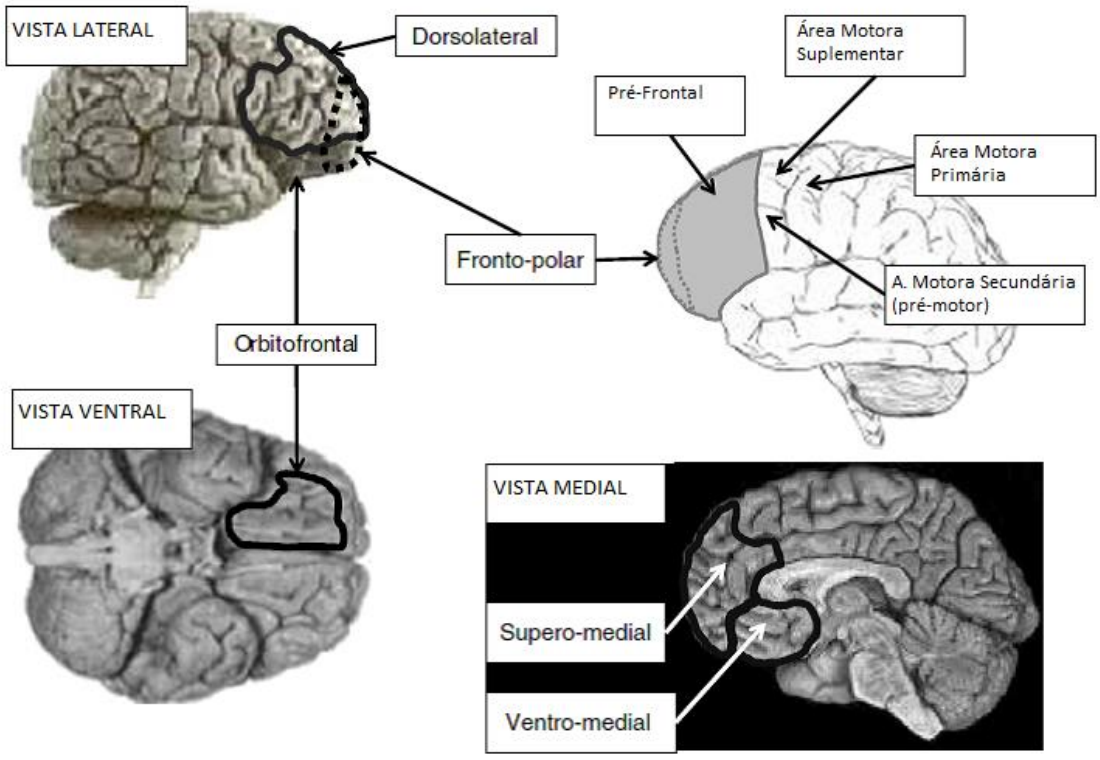

Figura 1. Vista Lateral, Ventral e Medial do Córtex. Retirado de Suchy (2009).

Embora os lobos frontais, em particular o córtex pré-frontal, desempenhem um papel importante nas funções executivas, não são a única área envolvida. A razão prende-se com o facto de os lobos frontais estarem ricamente conectados a outras regiões do cérebro, dependendo as funções executivas de uma rede complexa, ao invés de uma única

região dos lobos frontais. Desta forma, por exemplo, a memória de trabalho, depende não só do córtex pré-frontal dorsolateral, mas também do lobo parietal. Quanto à iniciação da resposta, encontra-se dependente não só do córtex pré-frontal esquerdo, medial e ventral, mas também dos gânglios da base e do tálamo (Suchy, 2009). Na realidade, e com base no conhecimento atual, todos os componentes das funções executivas requerem a integridade de circuitos que envolvem partes dos lobos frontais, os gânglios da base, o tálamo e o cerebelo, bem como áreas corticais exteriores aos lobos frontais (Scott & Schoenberg, 2011; Suchy, 2009).

Funções associadas ao córtex pré-frontal dorsolateral

A região do córtex pré-frontal dorsolateral (em inglês, *dorsolateral prefrontal cortex*, DLPFC) tem vindo a ser implicada a várias competências cognitivas, entre as quais, o planeamento, a resolução de problemas, a capacidade de mudar o foco de atenção, o controlo inibitório, bem como competências associadas à memória de trabalho. Défices observados após danos localizados nesta área, incluem comumente, dificuldades em avaliar a informação contextual, problemas na eficiência relacionada com a formulação e execução de um determinado plano, fraca flexibilidade cognitiva, dificuldade na multitarefa e na organização (Testa & Pantelis, 2009).

Desta forma, uma das principais funções associadas ao córtex pré-frontal dorsolateral é o planeamento, isto é, a capacidade de o sujeito identificar e organizar as etapas e os elementos necessários para realizar uma intenção ou alcançar um determinado objetivo (Lezak, Howieson, & Loring, 2004). No que refere à sua avaliação funcional, uma das tarefas associadas ao planeamento é a Torre de Londres (Van Den Heuvel et al., 2003; Wagner, Koch, Reichenbach, Sauer, & Schlösser, 2006). Quanto ao modo de apresentação da tarefa, parecem não existir diferenças entre a apresentação manual e a computorizada (McKinlay & McLellan, 2011) convém, contudo, manter o grau de dificuldade nos problemas apresentados ao sujeito para que seja avaliada a capacidade de planeamento (Kaller, Unterrainer, Rahm, & Halsband, 2004; Newman, Greco, & Lee, 2009). Outra das funções mais avaliadas cognitivamente é a capacidade de o sujeito mudar o foco de atenção (*set-shifting*) associando-se esta à flexibilidade cognitiva. O

instrumento mais utilizado mundialmente para avaliar estas competências é o *Wisconsin Card Sorting Tes*t (Lezak et al., 2004; Strauss, Sherman, & Spreen, 2006; Zald & Andreotti, 2010).

Por último, um dos temas associados à área DLPFC, que esteve ligado aos conceitos de inibição, prende-se com os paradigmas Stroop, bem como as funções que estes avaliam. Até há pouco tempo, acreditava-se que o paradigma Stroop avaliava a inibição de resposta, tendo sido este constructo aceite durante várias décadas. Com o surgimento de técnicas de ressonância magnética funcional e avaliação funcional dos paradigmas Stroop, este conceito sofreu alterações e o Stroop passou a estar ligado ao controlo inibitório, dependendo esta função do córtex pré-frontal dorsolateral (Miyake et al., 2000). Perdendo as tarefas Stroop a capacidade de avaliar as competências de inibição de resposta, encontraram-se outras tarefas para avaliar esta competência, sendo, uma das tarefas mais utilizadas, a tarefa *Go/Nogo*, dependente da área pré motora suplementar, em inglês *pre supplementary motor area* pre-SMA (Simmonds, Pekar, & Mostofsky, 2008).

Funções associadas ao córtex ventral (córtex orbitofrontal e ventromedial)

Uma das regiões de maior estudo associada ao córtex ventral é a região do córtex orbitofrontal (em inglês *orbitofrontal cortex*, OFC), esta inclui competências cognitivas relacionadas com questões sociais, afetivas, motivacionais e de personalidade. Estas competências são fundamentais para o sujeito autorregular as emoções e os comportamentos, integrando ainda as experiências subjetivas necessárias à autoconsciência e à individualidade. Estão ainda dependentes desta as competências associadas à capacidade de regular e selecionar uma resposta comportamental apropriada, o raciocínio e a tomada de decisão de problemas no domínio social. Os défices observados após dano nesta região incluem incapacidade de compreender e integrar diferentes pistas sociais e emocionais, dificuldade em tarefas de tomada de decisão, desinibição e perseveração (Testa & Pantelis, 2009).

Um instrumento desenvolvido especificamente para avaliar as lesões no córtex orbitofrontal é o *Iowa Gambling Task (IGT)* (Bechara, Damasio, Damasio, & Anderson, 1994). Durante a prova os sujeitos fazem uma série de 100 escolhas de um grupo de quatro

baralhos (A, B, C e D) resultando a escolha numa recompensa monetária fixa, e de forma ocasional, numa perda monetária. Quanto ao perfil de cada baralho, os baralhos A e B (com recompensa de 100 dólares a cada escolha) são classificados por Bechara e colegas (1994) como "desvantajosos" pois, a longo prazo, as penalizações ultrapassam as recompensas. Já os baralhos C e D (com recompensa de apenas 50 dólares em cada escolha) embora deem apenas 50 dólares de recompensa, a longo prazo, as recompensas ultrapassam as punições.

Clinicamente, o caso mais famoso que melhor ilustra as lesões associadas ao córtex orbitofrontal é o de Phineas Gage (1823-1860), um jovem ferroviário norte americano que, em 1848, sofreu uma grave lesão penetrante no crânio com uma longa vara de ferro, afetando o lobo frontal, em particular o córtex pré-frontal ventromedial (em inglês *ventromedial prefrontal cortex* VMPFC) localizado na região ventral ou inferior, deixando intacta a área dorsolateral do córtex pré-frontal (Testa & Pantelis, 2009).

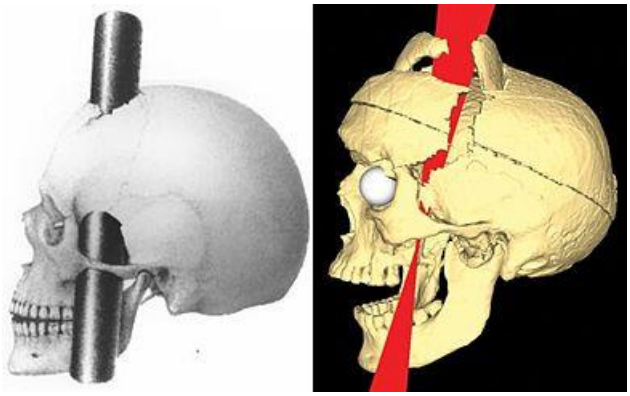

Figura 2. Descrição Visual da Lesão de Phineas Gage em 1848.

Apesar da lesão grave, Phineas fez uma recuperação rápida e completa, aparentemente com pouco impacto no seu funcionamento cognitivo, mantendo a inteligência, a memória e até mesmo a linguagem. No entanto, revelou alterações comportamentais muito evidentes: um homem anteriormente afável, responsável e confiável, tornou-se num indivíduo socialmente inadequado, rude, irresponsável, indiferente ao contacto social e incapaz de controlar as suas respostas emocionais e de tomar decisões lógicas (Bechara et al., 1994; Damasio, Grabowski, Frank, Galaburda, &

Damasio, 1994; Testa & Pantelis, 2009). Este caso também é informativo face às regiões que foram poupadas, ou seja, o córtex pré-frontal dorsolateral (DLPFC) revelando as competências cognitivas que se mantiveram inalteradas, incluindo a atenção, a linguagem, o planeamento ou até mesmo a flexibilidade cognitiva (Testa & Pantelis, 2009). Este foi, sem dúvida, um caso clínico importante para o português António Damásio, levando o seu trabalho ao surgimento de um novo interesse científico no córtex orbitofrontal com consequências positivas na prática clínica atual, em particular na neuropsicologia forense.

Importância da ressonância magnética funcional (fMRI) na neuropsicologia

A principal razão de a ressonância magnética funcional se ter tornado extremamente popular em investigações neuropsicológicas passa pelo facto de esta técnica ser não-evasiva, não exigir que o sujeito seja exposto à radiação, fornecendo uma elevada resolução enquanto os indivíduos executam uma tarefa cognitiva (Abutalebi, Doering, Rosa, & Mariën, 2008). Estas particularidades têm permitido que cada vez mais instrumentos de avaliação cognitiva tenham uma validade imagiológica associada a competências funcionais específicas e a determinadas áreas do córtex. São exemplo disso o *Iowa Gambling Task* que avalia a tomada de decisão e está associada ao córtex orbitofrontal (Bechara, 2000; Bechara, Damasio, Damasio, & Lee, 1999; Bechara et al., 1994). No que se refere ao córtex pré-frontal dorsolateral encontramos a tarefa Torre de Londres, que avalia o planeamento (Van Den Heuvel et al., 2003; Wagner, Koch, et al., 2006), as tarefas stroop que avaliam o controlo inibitório (G. Wagner, Sinsel, et al., 2006), e o *Wisconsin Card Sorting Task,* que avalia a flexibilidade cognitiva (Zald & Andreotti, 2010).

No que se refere aos restantes instrumentos utilizados nesta investigação, todos se encontram dependentes do funcionamento dos lobos frontais (Alexander, Stuss, & Fansabedian, 2003; Suchy, 2009; Witt, Laird, & Meyerand, 2008), revelando, desta forma, a importância do funcionamento frontal, quer no funcionamento dos quadros depressivos, quer na saúde mental em geral.

CAPÍTULO II

Depressão e comportamentos suicidas

O surgimento de um episódio depressivo major (ou unipolar) na vida de um sujeito, na grande maioria dos casos, parece indicar o aparecimento de uma doença crónica e recorrente. Clinicamente os casos de primeiros episódios agudos graves sem história anterior de depressão são raros, sendo que um episódio grave é precedido por uma série de episódios anteriores, subliminares e pouco evidentes. Quanto à recorrência, cerca de 50 a 85% dos pacientes que experimentam um primeiro episódio depressivo, apresentam episódios múltiplos subsequentes (Dozois & Dobson, 2002; Hopko, Lejuez, Armento, & Bare, 2004). No que se refere ao período de remissão entre episódios, este pode-se situar entre alguns meses a vários anos, podendo exibir os doentes, mesmo após recuperação, sintomas associados (Taube-Schift & A.Lau, 2008).

Desta forma, torna-se importante compreender os critérios de diagnóstico, e principalmente, os marcadores atuais relacionados com o funcionamento cognitivo de sujeitos deprimidos, para conseguir encontrar marcadores diferenciadores, entre estes e os sujeitos depressivos suicidas, com vista a levantar novas hipóteses clínicas associadas à prevenção, ao diagnóstico, ao tratamento e à reabilitação.

Prevalência da depressão

No que se refere à prevalência a 12 meses, a taxa atual situa-se nos 5%, com uma prevalência ao longo da vida entre os 15 e de 17%, sendo que as mulheres são duas vezes mais propensas do que os homens a sofrer de depressão. Estes números incluem apenas os indivíduos que preenchem os critérios de diagnóstico de depressão major, podendo ainda ser incluídos os números referentes à distimia que se aproxima dos 3 % (Dozois & Dobson, 2002; Taube-Schift & Lau, 2008)

Critérios de diagnóstico

A depressão é a mais frequente patologia diagnosticada em saúde mental (Taube-Schift & A.Lau, 2008). Os dois sistemas nosológicos mais utilizados para a classificação desta patologia são o Manual de Diagnóstico e Estatística das Perturbações Mentais, 5.ª edição (DSM-V; American Psychiatric Association (APA), 2013), e a Classificação Internacional de Doenças, versão 10 (ICD-10; World Health Organization (WHO), 1992).

Para um diagnóstico de depressão major, de acordo com o DSM-V (2013), um certo número de critérios devem ser respeitados. Os dois sintomas centrais da depressão, um dos quais devendo estar presente no sujeito, são: (1) pelo menos duas semanas de humor depressivo contínuo ou (2) pelo menos 2 semanas de uma perda de interesse ou prazer nas atividades. A acrescentar a qualquer um destes sintomas, o indivíduo deve experimentar pelo menos cinco sintomas adicionais entre os seguintes: humor depressivo na maioria do dia, quase todos os dias; acentuada diminuição do interesse ou prazer em todas ou quase todas as atividades na maior parte do dia, quase todos os dias; perda de peso significativo (quando não em dieta) ou ganho de peso (por exemplo, uma variação de mais de 5% de peso corporal num mês) ou uma diminuição do apetite; insónia ou hipersónia; agitação ou diminuição psicomotora; fadiga ou perda de energia; sentimentos de inutilidade ou culpa excessiva; diminuição da capacidade de pensar ou de se concentrar; pensamentos recorrentes de morte (não apenas medo de morrer) e ideação suicida recorrente.

No que se refere aos critérios de diagnóstico de depressão, recorrendo ao principal sistema nosológico utilizado na Europa, (ICD-10; WHO, 1992), o sujeito tem de apresentar pelo menos 2 semanas de humor deprimido, redução de energia, uma diminuição na atividade, uma perda de interesse e diminuição da concentração, cansaço muito evidente, alteração do sono, perturbação de apetite, baixa autoestima e autoconfiança, sentimentos de inutilidade ou culpa. O humor depressivo varia pouco de dia para dia. Esta alteração humor também pode ser acompanhada de sintomas "somáticos", como a perda de sentimentos de prazer, marcado retardamento psicomotor/ agitação, perda/ ganho de peso e uma perda de libido. Dependendo do número e do tipo de sintomas presentes, a depressão pode ser classificada enquanto ligeira, moderada ou

severa. Esta classificação aproxima-se mais do conceito de depressão unipolar/bipolar do que a classificação do DSM-V.

Alterações cognitivas da depressão (unipolar e bipolar)

A depressão unipolar encontra-se atualmente associada a uma ineficiência de funcionamento em vários domínios cognitivos, estando incluídas as alterações na atenção, na memória, nas funções executivas, na velocidade de processamento e na velocidade motora, na memória de trabalho e na fluência verbal (Austin, Mitchell, & Goodwin, 2001; McDermott & Ebmeier, 2009; Mitrushina, Boone, Razani, & D'Elia, 2005; Rogers et al., 2004; Stordal et al., 2004; Wagner, Doering, Helmreich, Lieb, & Tadić, 2012). Nos primeiros episódios, as alterações cognitivas tendem a ser reversíveis, com um declínio face ao aumento do número de episódios, sendo que o funcionamento cognitivo melhora após tratamento com antidepressivos (Biringer et al., 2005; Langenecker, Lee, & Bieliauskas, 2009; Lee, Hermens, Porter, & Redoblado-Hodge, 2012; S. Wagner et al., 2012).

Quanto às diferenças de funcionamento entre os pacientes depressivos unipolares e bipolares, os resultados têm vindo a revelar alterações mais significativas nos sujeitos bipolares, com o controlo inibitório mais alterado, pior desempenho na flexibilidade cognitiva e na fluência verbal. Já as alterações do planeamento têm sido mais evidentes nos sujeitos depressivos unipolares (Austin et al., 2001; Langenecker et al., 2009; Roiser, Rubinsztein, & Sahakian, 2009).

Suicídio

Pensamentos e motivações suicidas são um sintoma da depressão, não podendo contudo ser considerados uma inevitabilidade desta doença. O risco de suicídio entre as perturbações do humor é estimado em aproximadamente 15%, que é 15 vezes superior ao risco da população em geral (Taube-Schift & Lau, 2008). De acordo com dados da

Organização Mundial de Saúde (WHO, 2015), em cada ano, mais de oitocentas mil de pessoas morrem devido ao suicídio, o equivalente a uma morte a cada 40 segundos, sendo que nos últimos 45 anos, as taxas de suicídio a nível mundial aumentaram 60%. Em 2012, o suicídio representou a segunda maior causa de morte em indivíduos entre os 15 e os 29 anos (WHO, 2015), traduzindo-se num elevado custo para a sociedade (Dozois & Dobson, 2002).

Na Europa e nos EUA, um dos principais fatores de risco identificado é a doença mental, em particular a depressão e o consumo de álcool. Nas perturbações do humor, mais de metade dos pacientes expressa ideias de suicídio e um terço dos pacientes com ideias de suicídio comete um ato suicida (Kessler, Borges, & Walters, 1999), associando-se a depressão major a um elevado risco para o ato suicida (Lekka, Argyriou, & Beratis, 2006; Schneider et al., 2006).

Alterações cognitivas em pacientes suicidas

Em relação a marcadores cognitivos associados aos comportamentos suicidas, vários estudos têm indicado alterações nas funções executivas, tais como, a resolução de problemas, a fluência verbal e a flexibilidade mental, a inibição de resposta e o controlo inibitório (Jollant et al., 2011; Keilp et al., 2001, 2008, 2012a; King et al., 2000; Marzuk et al., 2005; Richard-Devantoy et al., 2012a; 2012b, 2014; Westheide et al., 2008), muito embora estas nem sempre sejam consistentes entre amostras, sendo que muitas das alterações executivas atribuídas à conduta suicida, coincidem com os mesmos marcadores cognitivos presentes na depressão (Austin et al., 2001; Beats et al., 1996; Biginger et al., 2005; Braaten et al., 2006; Cella et al., 2010; Gohier et al., 2009; Kertzman et al., 2010; Lee et al., 2012; McDermott & Ebmeier, 2009; Richard-Devantoy, 2012a, 2012b, 2014; Rogers et al., 2004; Roiser et al., 2009; Stordal et al., 2004; Wagner et al., 2012).

No que se refere à avaliação cognitiva de amostras clínicas de pacientes suicidas com presença de perturbações do humor, recentemente, vários estudos se têm debruçado sobre a avaliação de amostras de indivíduos depressivos suicidas, alguns incluindo quer pacientes unipolares, quer bipolares (e.g., Keilp et al., 2001, 2008; Marzuk et al., 2005); outros estudaram pacientes com comorbidades, como perturbações de personalidade

(e.g., Keilp et al., 2012a), mas poucos se centraram especificamente em suicidas depressivos unipolares (e.g., King et al., 2000; Richard-Devantoy et al., 2014; Westheide et al., 2008).

Entre esses estudos, destacamos os de King e colegas (2000), Richard-Devantoy e colegas (2012b) e Westheide e colegas (2008), que avaliaram o desempenho de pacientes suicidas unipolares não psicóticos em várias medidas neuropsicológicas. Os primeiros dois concentraram-se em amostras de pacientes mais velhos (mais de 50, e mais de 65 anos, respetivamente) e apenas o último controlou a ideação suicida atual. Ao passo que King e colegas (2000) não encontraram diferenças entre pacientes depressivos suicidas e depressivos não-suicidas, o estudo de Richard-Devantoy e colegas (2012b) mostrou um desempenho pior por parte da amostra de suicidas na inibição cognitiva. Por seu lado, Westheide e colegas (2008) encontraram diferenças entre indivíduos depressivos suicidas, com e sem ideação suicida atual, e grupo de controlo de sujeitos saudáveis. Os suicidas com ideação atual obtiveram pontuações mais elevadas no *Iowa Gambling Task* e no *Go/No-go Task* e, o total da amostra (suicidas com depressão unipolar) pontuou mais elevado no *Auditory Verbal Learning Test*, resultado esperado e associado ao quadro depressivo. A grande particularidade nos resultados deste estudo foi o facto de os autores terem utilizado um instrumento Go/No-go com paradigma complexo, algo associado por Simmonds e colegas (2008) à memória de trabalho. Para poder ser avaliada em exclusivo a inibição de resposta, os autores deveriam ter utilizado um instrumento Go/No-go com paradigma simples.

Os resultados obtidos por Westheide e colegas (2008) mostraram que a ideação suicida subjaz a défices mais severos nas funções executivas, sobretudo no que se refere à capacidade de tomada de decisão, de aprendizagem e à resposta inibitória, o que, para estes autores, pode ser interpretado como um sinal de inflexibilidade mental ou rigidez cognitiva entre os depressivos que apresentam ideação suicida.

A inibição cognitiva desempenha aqui um papel cimeiro dado que, de todas as funções executivas, é das que mais se relacionam com os comportamentos suicidas, ao serem, as responsáveis pelos processos de restrição de acesso a informação relevante, de supressão de informação já não relevante e limitação da recuperação incorreta de informação da memória de trabalho (Gohier et al., 2009; Richard-Devantoy et al., 2012a, 2012b). A inibição cognitiva traduz-se num mecanismo essencial a um controlo adequado das emoções, pensamentos e ações (Richard-Devantoy et al., 2012b), por isso, a presença

de défices na prossecução destes processos é passível de fornecer uma explicação para a tendência do indivíduo suicida para a ruminação, aliada à séria dificuldade sentida por este em descartar da mente pensamentos indesejados que contribuem para alimentar a ideação suicida e subjazem à tentativa de suicídio.

PARTE II – ESTUDOS EMPÍRICOS

Objetivos e Questões de Investigação

A revisão de literatura anteriormente efetuada permite-nos concluir que não existe um marcador cognitivo claro que diferencie os sujeitos suicidas daqueles que apresentam uma perturbação depressiva. Tornou-se, contudo, evidente que existem diferenças de funcionamento expressivas entre os sujeitos depressivos unipolares e bipolares.

Quanto à possibilidade de poder replicar os estudos internacionais anteriormente citados, procurando avaliar as principais funções dos lóbulos frontais, em termos práticos e clínicos, essa possibilidade tornou-se muito complexa inicialmente devido à falta de instrumentos de avaliação em Portugal. Tendo-se excluído a possibilidade de validar as versões comerciais para a população portuguesa, por um lado, em virtude da escassez de recursos humanos e económicos, por outro, ao período temporal envolvido num projeto dessa dimensão, optou-se por recorrer à colaboração de Shane Mueller, o criador da *PEBL Test Battery* (Mueller & Piper, 2014), um software livre que permite replicar informaticamente, de forma exata, os principais instrumentos de avaliação dos lóbulos frontais, entre eles, o *Finger Tapping Task*, o *Wisconsin Card Sorting Test*, a *Torre de Londres*, o *Iowa Gambling Task*, o *Victoria Stroop Test* e uma tarefa simples do *Go/No-go Task*.

A presente dissertação teve como finalidade investigar o funcionamento cognitivo de pacientes com depressão unipolar, excluindo das amostras os sujeitos com depressão bipolar e sintomas psicóticos, tentando perceber a influência de comportamentos suicidas anteriores no funcionamento cognitivo atual.

Os estudos empíricos seguintes procuraram dar resposta a questões de investigação tão específicas como: qual será a influência da idade, do género, da educação e da mão dominante no funcionamento motor de sujeitos com depressão unipolar? Será que a flexibilidade cognitiva é diferente entre sujeitos com depressão unipolar e sujeitos saudáveis sem patologia psiquiátrica? Será que existem diferenças no planeamento entre sujeitos com depressão unipolar e sujeitos saudáveis sem patologia psiquiátrica? Será que existem diferenças na tomada de decisão, avaliada com recurso ao *Iowa Gambling Task*, entre sujeitos com depressão unipolar e sujeitos saudáveis sem patologia psiquiátrica? Qual será a influência da idade no tempo de reação das funções da atenção e da inibição

de resposta em sujeitos portugueses sem patologia psiquiátrica? Qual a diferença no desempenho da inibição de resposta entre sujeitos suicidas e não suicidas, ambos os grupos com diagnóstico de depressão unipolar não psicótica?

Manuscrito I

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Title: Computerized Finger Tapping Task in adult unipolar depressed patients and healthy subjects: Influence of age, gender, education and hand dominance.

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Abstract

Current diagnostic criteria for depression include psychomotor retardation. Therefore, this study aimed to compare the performance of a sample of 51 unipolar depressed patients (30 women and 21 men, with a mean age of 45.12 years old [*SD* = 14.09]) to 51 healthy controls (29 women and 22 men, with a mean age of 44.49 years old [*SD* = 15.59]) in a computerized version of the Finger Tapping Test (FTT) from the Psychology Experiment Building Language (PEBL). Another objective was to test this version's validity in comparison to other FTTs. Results show that healthy controls outperformed depressed patients. Significant effects of age and gender were found. The results obtained indicate that FTT possesses adequate reliability values.

Keywords: Unipolar Depression, Fine Psychomotor Performance, Finger Tapping Test, Normative Data.

Introduction

Being motor retardation a common feature of depression (American Psychiatry Association, 2013; Caligiuri, & Ellwanger, 2000), tests of fine psychomotor performance, such as the Finger Tapping Test (FTT), have been widely utilized in several studies on depression (Arnold et al., 2005; Bashir, Khade, Kosaraju, Kumar, & Rani, 2013; Caligiuri, & Ellwanger, 2000; Hill, Keshavan, Thase, & Sweeney, 2004; Hueng et al., 2011; Kertzman et al., 2010; Lampe, Sitskoorn, & Heeren, 2004; Meyer et al., 2006; Rohling, Green, Allen, & Iverson, 2002; Schrijvers, Hulstijn, & Sabbe, 2008; Swann, Katz, Bowden, Berman, & Stokes, 1999) proving to be reliable to access impairments and discard malingering (Arnold et al., 2005; Rohling et al., 2002).

The FTT was developed as part of the Halstead-Reitan Battery (Halstead, 1947) and consists in a test of fine psychomotor performance, measured through self-directed manual motor speed and control (Christianson & Leathem, 2004; Strauss, Sherman, & Spreen, 2006), recurrently employed to assess impairment resulting from traumas, diseases, and other clinical conditions, such as brain injury (Arnold et al., 2005; Hubel, Yund, Herron, & Woods, 2013b; Kane, Roebuck-Spencer, Short, Kabat, & Wilken, 2007), Alzheimer's disease (Arnold et al., 2005; Dwolatzky et al., 2003, 2004; Kane et al., 2007), Parkinson's disease (Kane et al., 2007; Shimoyama, Ninchoji, & Uemura, 1990), multiple sclerosis (Kane et al., 2007; Wilken et al., 2003), mild cognitive impairment (Dwolatzky et al., 2003, 2004; Schweiger, Doniger, Dwolatzky, Jaffe, & Simon, 2003), and mental retardation (Arnold et al., 2005). Several researchers have utilized it to assess psychomotor effects of some drugs, like antiepileptics (Aldenkamp, Van Meel, Baker, Brooks, & Hendriks, 2002), chemotherapy (Stewart, Bielajew, Collins, Parkinson, & Tomiak, 2006), and antidepressants (Bashir et al., 2013). Furthermore, many find it resourceful to detect fake symptoms in medicolegal/forensic contexts (Arnold et al., 2005; Hubel et al., 2013b; Rohling et al., 2002), having also been used to study the relationship between handedness and performance, in order to draw inferences about the functional integrity of the two cerebral hemispheres (Hervé, Mazoyer, Crivello, Perchey, & Tzourio-Mazoyer, 2005; Peters, 1980; Schmidt, Oliveira, Krahe, & Filgueiras, 2000; Strauss et al., 2006).

The original manual of the FTT utilized a mechanical counter and a stopwatch (Christianson, & Leathem, 2004): Many limitations were ponted, as it could take several

hours, needed additional time for scoring and presenting results, and was exhausting for patients and to laborious for examiners (Hubel et al., 2013b). However, its efficacy still justifies its place among the most used instruments (Strauss et al., 2006). Therefore, recently, in an attempt to overcome such limitations, several computerized versions have emerged, able to measure response time more precisely, requiring less time to administer and generating instant scoring (Wilken et al., 2003). The FTT is now part of several recent batteries, such as the Computerized Neurocognitive Battery (Coleman, Moberg, Ragland, & Gur, 1997; Gur et al., 2010), the Automated Neuropsychological Assessment Metrics – ANAM^{4tm} – (Kane et al., 2007; Reeves, Winter, Bleiberg, & Kane, 2007; Wilken et al., 2003), the FePsy (Aldenkamp et al., 2002; Stewart et al., 2006) and the Neurotrax^{TM} Mindstreams^{TM} (Dwolatzky et al., 2003, 2004; Schweiger et al., 2003).

Our aim was to study the fine psychomotor performance of depressed patients, regarding effects of age, gender, education, and hand dominance. A computerized version of the FTT from the Psychology Experiment Building Language (PEBL) (Mueller, 2013), a free access battery, was used. Another objective was to test this version's validity, comparing the present results to others obtained by Christianson and Leathem (2004) and Hubel et al. (2013a).

According to literature, in FTT men tap faster, younger subjects show faster tapping rates; education is related to faster motor speed, and the dominant hand performs better. Our research hypotheses are based in these premises, as well as in the prediction that depressed patients are slower than healthy controls.

Method

Materials and Methods

Both studied samples, experimental and control groups, were comprised of 51 subjects each. The experimental (patients') group was composed of 30 women and 21 men, with a mean age of 45.12 years old (*SD* = 14.09) and a mean of 8.29 (*SD* = 3.72) years of education. The participants from this group were recruited in the city of Faro (Portugal), more precisely from the Department of Psychiatry and Mental Health of Algarve Hospital (a state owned entity). With analogous characteristics, healthy controls comprised 29 women and 22 men, with a mean age of 44.49 years old (*SD* = 15.59) and a mean of 9.50 (*SD* = 3.63) years of education (Table 1). Patients and controls did not differ significantly regarding gender ($\chi 2$ = .040, *df* = 1, *p* = .841), age (*t* = .213, *df* = 100, *p* = .832, *d* = .042), and education (*t* = -1.668, *df* = 100, *p* = .099, *d* = -.330).

Statistically, participants were divided into three age groups: (a) 17-40; (b) 41-50; and (c) more than 51 years. Regarding education, participants were also divided into three groups: (a) up to 6 years of education; (b) 9 years of education; and (c) 12 and more years of education. We only considered the completed cycles of education (i.e., 4th grade, 6th grade, 9th grade, 12th grade, and university), but then, only three groups were considered, since there were very few elements with 4 years of education, as well as with higher education. All participants were Caucasians and Portuguese speakers.

Table 1

Each participant completed a health and demographic questionnaire and depression diagnoses were confirmed through the MINI (Mini International Neuropsychiatric Interview) (Sheehan et al., 1997) and the BSI (Brief Symptom Inventory) (Canavarro, 2007). Those with current or prior history of bipolar disorders, schizophrenia, major psychosis, or who met criteria for dementia, substance abuse, neurologic disease, including head injury involving a loss of consciousness, and subjects who did not complete the full 50-second tapping period for both fingers or reported

having a problem with their hands or indicators were excluded. To discard malingering, Rey 15-Item Memory Test (15-IMT) was used (Simões et al., 2010).

This study was approved by the Algarve Hospital's Ethics Committee, in conformity with the Helsinki declaration. After being provided with all the information about the study, all the participants signed an informed consent statement.

All analyzes were conducted using the Statistical Package for the Social Sciences (SPSS) version 20.0. The level of significance was set at $p < .05$.

The computerized Finger Taping Task (Mueller, 2013), a free software from PEBL Test Battery (Mueller & Piper, 2014), was performed with the left and right index fingers: five consecutive trials in each hand, with a brief rest following each trial (10-seconds), and a longer one (30-seconds) every five trials. The mean of taps was averaged over five trials for each hand.

Results

We confirmed effects of slowing over in depressed patients, and, for both groups, significant effects of hand dominance (faster tapping in the dominant hand), gender (faster tapping in men), and age (slower tapping on participants over 51 years old) (Tables 2, 3 and 4).

Table 2

We found differences between total scores for depressed subjects and healthy controls, concerning both dominant (D) (t = -4.040, df = 100, p = .001, d = -.800) and non-dominant (ND) hands (t = -.2.873, df = 100, p = .005, d = -.569). A one-way analysis of variance (*ANOVA*) showed significant group differences regarding education (depression D: $F(2,48) = 8.78$, p = .001, η_p^2 =.268; ND: $F(2,48) = 4.91$, p = .011, η_p^2 =.170. *vs.* healthy D: $F(2,48) = 7.06$, p = .002, η_p^2 =.227; ND: $F(2,48) = 7.06$, p = .002, η_p^2 =.228) and age (depression D: $F(2,48) = 5.91$, p = .005, η_p^2 =.198; ND: $F(2,48) = 2.96$, p = .061, η_p^2 =.110. *vs.* healthy D: $F(2,48) = 8.39$, p = .001, η_p^2 =.259; ND: $F(2,48) = 7.91$, p = .001, η_p^2 =.248). *T*-tests demonstrated significant group differences concerning gender (depression D: t = .2.167, df = 49, p = .035, d = .608; ND: t = .2.721, df = 49, p = .009, d = .750 *vs*. healthy D: t = .2.167, df = 49, p = .012, d = .743; ND: t = .2.274, df = 49, p = .027, d = .629). For demographic variables, a shared variance of 49% was found for healthy subjects (D: R^2 = .493, $F(3, 47) = 15.25$, p = .001; ND: R^2 = .495, $F(3, 47)$ = 15.38, p = .001) and 42-35% for patients with depression (D: R^2 = .429, $F(3, 47) = 11.77$, p = .001; ND: R^2 = .357, $F(3, 47) = 8.70$, p = .001) (Table 3).

Table 3

Christianson and Leathem (2004) compared four versions of the FTT, involving minor differences in procedures and response devices, namely the Halstead-Reitan manual FTT (Halstead, 1947), the Massey University manual FTT, the Western Psychological Services Digital FTT, and a Computer FTT, having verified high

correlations between the tapping scores of all four instruments, confirming the construct validity of the latter. Likewise, Hubel et al. (2013a) tested the validity of a novel FTT from the California Cognitive Assessment Battery (CCAB), obtaining analogous results through the comparison to the Halstead-Retain FTT, the Computerized Finger Tapping, the T3 Computer-assisted Finger Tapping Task, the Western Psychological Services Electronic Tapping Test, and the Computerized Neurocognitive Scanning Vital Signs (CNSVS). Similarly, aiming to validate the FTT from the PEBL Test Battery (Mueller, 2013; Mueller & Piper, 2014), we compared our study's results with those obtained by Christianson and Leathem (2004) and Hubel et al. (2013a) and confirmed similar results regarding mean tapping rates in tree studies (*ANOVA* D: F = .890, *df* = 2,1.653, *p* = .411; ND: *F* = .502, *df* = 2,1.653, *p* = .606).

Table 4

Discussion

Many studies have previously reported greater finger tapping speed in males (Arnold et al., 2005; Ashendorf, Vanderslice-Barr, & McCaffrey, 2009; Bornstein, 1985; Christianson & Leathem, 2004; Coleman et al., 1997; Elias, Robbins, Walter, & Schultz, 1993; Gur et al., 2010; Heaton et al., 2004; Hubel et al, 2013a, 2013b; Mitrushina, Boone, Razani, & D'Elia, 2005; Peters, 1980; Peters & Campagnaro, 1996; Ruff & Parker; 1993; Schmidt et al., 2000; Ylikoski et al., 1998), outperforming females by three to five taps per 10-second interval (Ashendorf et al., 2009; Mitrushina et al., 2005). Heaton, Miller, Taylor, and Grant (2004) reported that about 16% to 20% of the test scores were accounted for by gender. We also verified gender differences for depression and healthy groups. The response patterns inherent to gender differences remain, however, unclear. According to Hubel and colleagues (2013a), they seem to be specific for repetitive movements, once there are evidence that performance in the Grooved Pegboard Test tends to be superior in women (Bornstein, 1985; Peters & Campagnaro, 1996; Ruff & Parker, 1993). Nicholson and Kimura (1996) analyzed gender differences regarding manual speed and concluded that men's speed advantage might be explained by a relative gain in the amount of fast-twitch muscle at puberty. Ruff and Parker (1993) suggested that gender differences in FTT performance may also be a reflection of different age effects.

The FTT has been reported to be sensitive to changes related to aging (Ylikoski et al., 1998). Better performance is usually associated with younger age, as many studies have shown older subjects tend to have significantly slower tapping rates (Aoki & Fukuoka, 2010; Ashendorf et al., 2009; Bartzokis et al., 2010; Bornstein, 1985; Elias et al., 1993; Gur et al., 2010; Hubel et al., 2013a, 2013b; Ruff & Parker, 1993; Shimoyama et al., 1990; Turgeon et al., 2011; Ylikoski et al., 1998). We also verified age-related effects, with older subjects performing poorly. Its nature remains vague though. To Bartzokis et al. (2010), age-related trajectory of finger tapping speed can be associated with brain myelin integrity, reaching its peak in mid-life and declining in older age, eventually leading to psychomotor slowing.

We noticed effects of education on tapping speed. Nevertheless, according to Strauss, Sherman, and Spreen (2006), results on motor tasks have a propensity to be very modestly influenced, if at all, by such factor. Heaton et al. (2004) verified that education accounts for only about 2% to 4% of the variance in tapping scores. Still, as reported by

other studies, best performances are often associated with more years of education, concerning not only higher levels of formal instruction (Ashendorf et al., 2009; Bornstein, 1985; Gur et al., 2010; Ruff & Parker, 1993), but also parental education (Gur et al., 2010).

Consistent with many reports (Hervé et al., 2005; Hubel et al., 2013a, 2013b; Peters, 1980; Schmidt, et al., 2000; Teixeira, 2008; Todor & Smiley-Oyen, 1987), we corroborated considerable differences between the dominant and the non-dominant hands regarding both groups. Tapping performance has been employed as an indicator of hand dominance (Ashendorf et al., 2009; Hervé et al., 2005; Hubel et al., 2013a, 2013b; Peters, 1980; Ruff & Parker, 1993; Schmidt et al., 2000; Teixeira, 2008; Todor & Smiley-Oyen, 1987), with the dominant index finger typically producing approximately 10% more taps (Ashendorf et al., 2009; Hubel et al., 2013a). In the FTT, the preferred hand tends to perform more quickly, regularly (Peters, 1980), and precisely (Todor, & Smiley-Oyen, 1987). This may be explained by differential effects of fatigue (Peters, 1980). Moreover, as Todor and Smiley-Oyen (1987, p.72) emphasized, the left hand (non-dominant hand) "is not simply a slower version of the right", therefore dissimilarities between hands may be due to inherent qualitative differences, verified, for instance, through the amount and modulation of force applied in each movement (Todor & Smiley-Oyen, 1987). Nonetheless, depending on the task, the preferred hand may not necessarily be the most proficient one, which is common and does not indicate, by it self, the presence of a neurological disturbance (Strauss et al., 2006). While tapping rates have shown to be similar for left and right-handers (Ruff & Parker, 1993), intermanual differences have a tendency to be smaller for left-handers who often exhibit reduced hand asymmetries (Hervé et al., 2005; Hubel et al., 2013a; Peters, 1980; Schmidt et al., 2000), possibly due to a more mixed pattern of cerebral dominance (Hubel et al., 2013a).

Also as expected, we found significant impairment in psychomotor speed in unipolar depressed subjects affected by demographic factors. Psychomotor performance in depressed subjects may be further influenced by other factors, such as hospitalization status/duration, severity, subtype and duration of depression, and medication intake (Bashir et al., 2013). According to Rohling and colleagues (2002), performance is more affected by hospitalization status than mood status. Regarding severity and subtype, Swann and colleagues (1999) studied psychomotor performance in bipolar and unipolar affective disorders and – in contrast to the present study's results – found that motor

retardation was related to severity of depression only in bipolar patients. Hill and colleagues (2004) verified a significant psychomotor impairment in psychotic depressed subjects, but no differences between non-psychotic depressed patients and healthy controls. As for duration, Lampe and colleagues (2004), who studied the effects of recurrent major depressive disorder, noticed no significant link between cumulative depression duration and psychomotor retardation. Many have addressed specifically effects of medication on psychomotor speed (Aldenkamp et al., 2002; Bashir et al., 2013; Stewart et al., 2006). First-line medication for depression often includes substances (e.g., fluoxetine, venlafaxine and paroxetine) liable to affect cognitive and function performance (Bashir et al., 2013). Bashir and colleagues (2013) verified a significant speed impairment regarding patients on antidepressants. Therefore, there are researchers (e.g., Hueng et al., 2011; Meyer et al., 2006; Swann et al., 1999) who chose to study only drug-free depressive subjects to access more precisely the actual impact of the illness itself on psychomotor function. This was not our purpose and that may somehow represent a limitation to our study. Aiming to explain psychomotor retardation in depression, Caligiuri and Ellwanger (2000, p.84) argued that, as in Parkinson's disease, it may derive from "disturbed dopamine neurotransmission within the basal ganglia". Assuming the hypothesis that putamen D^2 binding potential would be higher during major depressive episodes, featuring motor retardation, Meyer et al.'s (2006) pioneer study results indicated that extracellular dopamine is lower in depressed individuals.

Studies on depression have shown a broad variety of results, despite a growing field of research, how, to what extent it affects psychomotor function are questions that still remain ill-defined.

Table 5

Table 6

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Table 1. Demographic Information (N = 102)

	Depression[a]	Healthy[b]	Total
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Age	45.12 (14.09)	44.49 (15.59)	44.80 (14.79)
Education	8.29 (3.72)	9.50 (3.63)	8.90 (3.71)
		n (%)	
Age Group			
17-40	17 (33.3)	19 (37.3)	36 (35.3)
41-50	17 (33.3)	16 (31.4)	33 (32.4)
More than 51 years	17 (33.3)	16 (31.4)	33 (32.4)
Education Group (grades)			
$\leq 6^{th}$	23 (45.1)	15 (29.4)	38 (37.3)
9^{th}	14 (27.5)	17 (33.3)	31 (30.4)
$\geq 12^{th}$	14 (27.5)	19 (37.3)	33 (32.4)
Gender			
Male	21 (41.2)	22 (43.1)	43 (42.2)
Female	30 (58.8)	29 (56.9)	59 (57.8)

Note. [a]*n*= 51, [b]*n*= 51

Table 2. Descriptive Statistics (N = 102)

	Dominant		Non-dominant	
	Depression[a] *M* (*SD*)	Healthy[b] *M* (*SD*)	Depression[a] *M* (*SD*)	Healthy[b] *M* (*SD*)
Age				
17-40	56.82 (7.85)	62.57 (5.14)	48.94 (9.51)	53.94 (6.87)
41-50	50.35 (9.64)	56.56 (7.94)	44.47 (9.54)	49.43 (6.81)
+51	46.70 (8.46)	54.12 (5.74)	41.29 (8.50)	45.12 (5.84)
F	5.915	8.394	2.963	7.911
p	.005	.001	.061	.001
η_p^2	.198	.259	.110	.248
Education (grades)				
$\leq 6^{th}$	46.04 (9.35)	53.13 (6.33)	40.65 (9.25)	45.46 (5.33)
9^{th}	54.21 (7.66)	58.52 (6.18)	47.57 (8.94)	48.88 (6.64)
$\geq 12^{th}$	57.00 (6.88)	61.47 (6.78)	49.21 (8.16)	53.94 (7.49)
F	8.781	7.061	4.910	7.068
P	.001	.002	.011	.002
η_p^2	.268	.227	.170	.228
Gender				
Male	54.61 (9.90)	60.90 (6.63)	49.00 (10.72)	52.36 (8.28)
Female	48.96 (8.62)	55.86 (6.94)	42.03 (7.58)	47.79 (6.07)
t	2.167	2.621	2.721	2.274
p	.035	.012	.009	.027
d	.608	.743	.750	.629
Total Score	51.29 (9.50)	58.03 (7.19)	44.90 (9.55)	49.76 (7.39)
t (BS)	-4.040		-2.873	
p	.000		.005	
d	-.800		-.569	

Note. [a]*n*= 51, [b]*n*= 51, BS= Between Samples

Table 3. Percentage of Variance Accounted for by Demographic Variables

	Depression[a]						Healthy[b]			
	(% of variance)									
	Age	Educ	Sex	Comb	BSI-D	Comb	Age	Educ	Sex	Comb
Dominant	24[1]	26[1]	8[2]	42[1]	23[2]	53[2]	22[1]	25 [1]	12[2]	49[1]
Non-dominant	14[2]	19[1]	13[2]	35[1]	34[2]	62[2]	24[1]	26[1]	9[2]	49[1]

Note. [a]*n*= 51, [b]*n*= 51, [1]$p \leq .001$, [2]$p < .05$, BSI-D = Depression scale from Brief Symptom Inventory; Educ = Education; Comb = Combined

Table 4. Comparison of the FTT from PEBL to Other Tapping Test Data

	Dominant		Non-dominant	
	Current Study[a]	Christianson (2004)[b]	Current Study[a]	Christianson (2004)[b]
	M (SD)	M (SD)	M (SD)	M (SD)
Total Score	58.03 (7.19)	56 (7.1)	49.76 (7.39)	49.6 (5.4)
t	1.610		.145	
p	.109		.884	
d	.284		.024	

	Current Study[a]	Hubel (2013a)[c]	Current Study[a]	Hubel (2013a)[c]
	M (SD)	M (SD)[d]	M (SD)	M (SD)[d]
Total Score	58.03 (7.19)	56.3 (9.6)	49.76 (7.39)	50.4 (8.5)
t	1.274		.531	
p	.202		.595	
d	.203		-.080	

Note. [a]*n*= 51, [b]*n*= 86, [c]*n*= 1.519, [d]1st 10-sec. average

Table 5. Percentile of Healthy Subjects by Age and Gender

	Dominant					Non-dominant					
	Age			Gender		Age			Gender		
	17-40	41-50	more than 51 years	M	F	17-40	41-50	more than 51 years	M	F	
5	53.00	40.00	45.00	49.15	42.50	41.00	37.00	38.00	40.00	37.50	5
10	54.00	47.00	47.80	50.00	49.00	47.00	40.50	39.40	40.60	41.00	10
25	60.00	52.00	50.00	56.25	52.00	48.00	44.50	42.00	44.00	43.00	25
50	63.00	55.00	53.00	62.00	54.00	53.00	48.50	43.50	53.00	47.00	50
75	64.00	62.50	59.50	63.25	60.50	58.00	55.50	49.25	59.25	52.00	75
90	71.00	70.60	63.90	70.70	66.00	66.00	59.60	55.10	64.50	58.00	90
95	-	-	-	73.55	70.00	-	-	-	66.85	59.50	95

Note. n= 51

Table 6. Percentile of Depressed Subjects by Age and Gender

	Dominant					Non-dominant					
	Age			Gender		Age			Gender		
	17-40	41-50	more than 51 years	M	F	17-40	41-50	more than 51 years	M	F	
5	44.00	33.00	31.00	33.90	31.55	33.00	29.00	26.00	30.60	27.65	5
10	48.00	33.80	31.80	43.20	33.10	38.60	33.00	29.20	36.20	30.30	10
25	51.50	45.00	43.50	48.50	45.00	43.50	37.00	36.50	41.00	36.75	25
50	55.00	50.00	48.00	51.00	49.50	47.00	43.00	40.00	48.00	42.00	50
75	61.50	56.50	52.00	61.00	55.00	53.00	50.00	47.00	55.50	47.50	75
90	73.00	67.00	58.40	71.80	60.90	68.60	60.40	54.60	67.60	51.90	90
95	-	-	-	73.00	62.00	-	-	-	70.70	54.80	95

Note. n= 51

Manuscrito II

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Title: Executive dysfunction in non-psychotic unipolar depressed patients assessed by the Wisconsin (Berg) Card Sorting Test

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Abstract

Alterations in executive functioning are frequent in depressed subjects, being the Wisconsin Card Sorting Test (WCST) one of the most utilized instruments to assess it, even though, when individually compared, this test's items did not show consistency. This study aimed to compare the performance of a group comprising 36 non-psychotic unipolar depressed patients (23 women and 13 men, with a mean age of 44.28 years old [*SD* = 14.78]) with 36 healthy controls (22 women and 14 men, with a mean age of 42.22 years old [*SD* = 15.19]) in a computerized version of WCST. We found significant differences between depressed patients and healthy controls regarding number of categories, perseverative responses, perseverative errors, non-perseverative errors, percentage of conceptual level responses and failure to maintain set, clearly influenced by the variable age, which showed a shared variance between 17% and 33% in depressive patients' performance and between 16% and 26% in healthy controls' performance. Results allowed us to identify differences in performance between the two groups, therefore this version of the WCST revealed itself a reliable alternative to assess executive functions (EFs), accessible to all clinicians.

Keywords: Unipolar Depression, Executive Functions (EFs), Set-shifting, Wisconsin Card Sorting Test (WCST), Normative Data.

Introduction

The Wisconsin Card Sorting Test (WCST) is one of the most currently used instruments in clinical practice to assess executive functioning. It is common its utilization to assess set-maintenance and set-shifting abilities, involved in the execution of prefrontal areas (Carrillo-de-la-Peña & García-Larrea, 2007), more precisely dorsal regions of prefrontal cortex (PFC) (Zald & Andreotti, 2010). Despite this fact, the main manuals of neuropsychology caution against using WCST results isolatedly as a marker of damage in the frontal lobe, hence recommending convergent measures of assessment (Lezak, Howieson, & Loring, 2004; Strauss, Sherman, & Spreen, 2006).

According to the Journal Citation Reports (JCR), over the last few years, the number of scientific publications has increased widely and journals that published ten or more papers on the WCST have a high impact factor (Silva-Filho, Pasian, & Humberto, 2011). Clinical studies with Portuguese-speaking population have also increased, especially in Brazil, in particular focusing on clinical disorders such as obesity (Duchesne et al., 2010; Sousa & Ribeiro, 2012), alcohol dependence (Salgado et al., 2009), substance dependence (Almeida, Flores, & Scheffer, 2013; Matumoto & Rossini, 2013), Alzheimer's disease (Hamdan & Bueno, 2005), as well as on specific population, such as elderly (Beckert, Irigaray, & Trentini, 2012; Wagner & Trentini, 2009) and murderers (Del Pino & Werlang, 2008).

Given that the WCST is an instrument that provides a large amount of statistical information, there are frequently questions about what measures are more important in order to assess the subject's performance, being the most utilized the result of perseverative errors, attempts to achieve the first category, and failure to maintain set (Strauss et al., 2006), as well as non-perseverative errors and number of achieved categories (Greve, Ingram, & Bianchini, 1998; Greve, Bianchini, Hartley, & Adams, 1999; Greve, Stickle, Love, Bianchini, & Stanford, 2005).

Concerning its formats, over the last few years, various computerized versions of the WCST have emerged, either for application or scoring, partly due to the fact that recording and scoring errors are common in the paper version of the test. Clinically, results have been similar in manual and computerized versions (Fortuny & Heaton, 1996).

Regarding depressed patients' performance in WCST, although healthy subjects do often achieve more categories than major depressive disorder (MDD) patients (Wagner, Doering, Helmreich, Lieb, & Tadić, 2012), results have not shown consistency over the past few years. Differences have appeared regarding only number of errors, non-perseverative errors and percentage of conceptual responses (Degl'Innocenti, Agren, & Bäckman, 1998), number of categories and perseverative errors (Moritz et al., 2002), perseverative errors (Harvey et al., 2004), and, failure to maintain set and perseverative errors (Stordal et al., 2004).

Therefore, this study aimed to compare the performances of a sample of non-psychotic unipolar depressed patients with healthy controls, concerning the main psychometric markers in a computerized version of the WCST. One other objective of the current study was to present initial normative data of this version in order to enable its utilization in clinical contexts and in further investigation. This study is important because, on the one hand, it allowed to understand the cognitive functioning of unipolar depressed patients (without any influence of depressive disorders with manic and psychotic symptoms [e.g., bipolar and schizoaffective]), and, on the other hand, provided initial normative data so that clinicians across the world can use this instrument.

Method

Participants

Both studied samples, experimental and control groups, were comprised of 36 subjects each. The experimental (patients') group was composed of 23 women and 13 men, with a mean age of 44.28 years old (*SD* = 14.78) and a mean of 8.94 (*SD* = 3.54) years of education. The participants from this group were recruited in the city of Faro (Portugal), more precisely from the Department of Psychiatry and Mental Health of Algarve Hospital (a state owned entity). With analogous characteristics, healthy controls comprised 22 women and 14 men, with a mean age of 42.22 years old (*SD* = 15.19) and a mean of 9.53 (*SD* = 3.68) years of education. Patients and controls did not differ significantly regarding gender (χ^2 = .059, *df* = 1, *p* = .808), age (*t* = .583, *df* = 70, *p* = .562, *d* = .137), and education (*t* = -.978, *df* = 70, *p* = .331, *d* = -.163). All participants were Caucasians and Portuguese speakers.

Measures

A computerized version of the WCST (Mueller, 2013), from the Psychology Experiment Building Language (PEBL), a free access battery (Mueller & Piper, 2014), described in greater detail elsewhere (Lyvers & Tobias-Webb, 2010; Piper et al., 2012), was employed.

The same computer running Microsoft Windows 8.1 was used with all subjects, with a touch screen in order to minimize the difficulties of older subjects in using a mouse or a keyboard, and to attempt reproduce the manual version regarding the way of choosing the card.

We utilized a total number of 128 cards (i.e., two packs of 64 cards) and the principles were color, form or number, which changed every ten trials. After each trial, a feedback ("correct" or "incorrect") was displayed for 500 milliseconds (ms). Results obtained in each trial were provided by the software.

Procedures

All participants were assessed individually, during the morning, by a psychologist specifically certified for the purpose (Ahonen, Dunham, & Getty, 2012; Anderson, Deane, Lindley, & Loucks, 2012).

Each participant completed a health and demographic questionnaire and depression diagnoses were confirmed through the MINI (Mini International Neuropsychiatric Interview) (Sheehan et al., 1997), the BSI (Brief Symptom Inventory) (Canavarro, 2007) and the Hamilton Depression Rating Scale for Depression (HAM-D – 17-item) (Sousa, Lopes, & Vieira, 1979). Exclusion criteria were current or prior history of bipolar disorders, schizophrenia, major psychosis, substance abuse, dementia and neurologic disease, including head injury involving a loss of consciousness. To discard malingering, Rey 15-Item Memory Test (15-IMT) was used (Simões et al., 2010).

This study was approved by the Algarve Hospital's Ethics Committee, in conformity with the Helsinki declaration. After being provided with all the information about the study, all participants signed an informed consent.

All analyzes were conducted using the Statistical Package for the Social Sciences (SPSS), version 20.0. The level of significance was set at $p < .05$.

Results

Results showed statistically significant differences between unipolar depressed patients and controls regarding number of achieved categories (t = -2.911, df = 64.6, p = .005, d = -.692), perseverative responses (t = 2.408, df = 70, p = .019, d = .568), perseverative errors (t = 3.303, df = 70, p = .002, d = .778), non-perseverative errors (t = 2.555, df = 70, p = .013, d = .602), percentage of conceptual level responses (t = -3.518, df = 70, p = .001, d = -.829), and failure to maintain set (t = 2.108, df = 57.9, p = .039, d = .505).

Depressed patients showed a higher mean in trials to achieve the first category (M = 26.25, SD = 24.70) compared to healthy controls (M = 18.08, SD = 12.94), however, that difference was not statistically significant (p = .085) (Table 1).

Table 1

Healthy controls exhibited a strong negative correlation between the demographic variable age and number of achieved categories (r(36) = -.519, p = .001) and percentage of conceptual level responses (r(36) = -.487, p = .003), as well as a strong positive correlation regarding perseverative errors (r(36) = .469, p = .004), trials to achieve the first category (r(36) = .482, p = .003), and failure to maintain set (r(36) = .401, p = .015) (Table 2).

Table 2

Similar results were observed in the unipolar depressed patients' group, showing a strong negative correlation between age and number of achieved categories (r(36) = -.418, p = .011) and percentage of conceptual level responses (r(36) = -.531, p = .001), and a strong positive correlation regarding perseverative errors (r(36) = .582, p = .001).

The variable age also maintained a high shared variance in healthy controls with regard to number of achieved categories (R^2 = .269, F(1, 34) = 12.54, p = .001), perseverative errors (R^2 = .220, F(1, 34) = 9.58, p = .004), percentage of conceptual level responses (R^2 = .238, F(1, 34) = 10.59, p = .003), trials to achieve the first category (R^2 = .233, F(1, 34) = 10.31, p = .003), and failure to maintain set (R^2 = .161, F(1, 34) = 6.51, p = .015).

In the patients' group, however less significant, a shared variance between age and number of achieved categories (R^2 = .175, F(1, 34) = 7.21, p = .011), perseverative errors (R^2 = .338, F(1, 34) = 17.39, p = .001), and percentage of conceptual level responses (R^2 = .282, F(1, 34) = 13.34, p = .001) was evident.

Discussion

We performed a student's *t*-test to compare the current study's results to those obtained by a similar one that used a computerized version of WCST as well (Merriam, Thase, Haas, Keshavan, & Sweeney, 1999) (Table 3) and found no significant differences, except for percentage of conceptual level responses in patients' group (t = 2.260, df = 113, p = .025, d = -.454) and trials to achieve the first category in healthy controls (t = 2.341, df = 95, p = .021, d = .446).

Table 3

These differences may be due to mean difference in age between studies (p = .001), having this variable a percentage of variance of 28% in unipolar depressed patients regarding percentage of conceptual level responses and of 23% in healthy controls concerning trials to achieve the first category.

As far as depressed subjects' performance is concerned, the current study focused only on non-psychotic unipolar depressed patients and therefore it was possible to find differences in perseverative errors, categories, failure to maintain set and percentage of conceptual level responses – the test's main neuropsychological markers (set-shifting, set-failure and insight) –, enabling us to validate individually results obtained by previous studies (Degl'Innocenti et al., 1998; Harvey et al., 2004; Moritz et al., 2002; Stordal et al., 2004).

This study's main limitation was the size of the sample concerning both patients and healthy controls, which prevented us from validating clearly normative data of this test. Future research comparing wider numbers of subjects is therefore recommended.

Since this is an instrument not covered by copyright law, we can hypothesize the sampling being hereafter carried out not by a clinician individually, but more consistently by several psychologists, which might allow the increase of the reference sample size.

In order to share these initial data, we present a percentile table of the present sample (Table 4).

Table 4

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Table 1. Descriptive Statistics (N = 72)

	Depression [a]	Healthy [b]				
	M (*SD*)	*M* (*SD*)	*t*	*df*	*p*	*d*
Number of categories achieved	4.41 (1.74)	5.47 (1.29)	-2.911	64.6	.005	-.692
Perseverative responses	49.36 (15.59)	41.66 (11.14)	2.408	70	.019	.568
Perseverative errors	20.13 (12.39)	11.55 (9.45)	3.303	70	.002	.778
Non-perseverative errors	16.03 (11.02)	10.01 (8.84)	2.555	70	.013	.602
% Conceptual level responses	55.69 (19.37)	71.49 (18.73)	-3.518	70	.001	-.829
Trials to achieve 1st category	26.25 (24.70)	18.08 (12.94)	1.757	52.8	.085	.414
Failure to maintain set	1.36 (1.41)	.77 (.86)	2.108	57.9	.039	.505

Note. [a] n= 36, [b] n= 36

Table 2. Correlations and Shared Variances Between WCST Scores and Age

	Depression [a]		Healthy [b]	
	r	r^2	*r*	r^2
Number of categories achieved	-.418*	.175*	-.519**	.269**
Perseverative errors	.582**	.338**	.469**	.220**
% Conceptual level responses	-.531**	.282**	-.487**	.238**
Trials to achieve 1st category	.052	.003	.482**	.233**
Failure to maintain set	.101	.010	.401*	.161*

Note. [a] n= 36, [b] n= 36, * $p \leq .05$, ** $p \leq .01$

Table 3. Comparison of the Current Study's Results to Merriam and colleagues (1999) (*N* =212)

	Depression					
	Current Study [a]	Merriam (1999) [b]				
	M (*SD*)	M (*SD*)	*t*	*df*	*p*	*d*
Age (years)	44.28 (14.78)	35.49 (8.12)	4.109	113	.001	.738
HDSD – 17-item	20.44 (7.40)	16.79 (6.11)	2.776	113	.006	.537
Number of categories achieved	4.41 (1.74)	5.00 (1.53)	1.836	113	.069	-.360
Perseverative errors	20.13 (12.39)	17.57 (12.42)	1.025	113	.307	.206
% Conceptual level responses	55.69 (19.37)	64.42 (19.06)	2.260	113	.025	-.454
Trials to achieve 1st category	26.25 (24.70)	18.84 (16.83)	1.879	113	.062	.350
Failure to maintain set	1.36 (1.41)	1.08 (1.27)	1.058	113	.291	.208
	Healthy					
	Current Study [c]	Merriam (1999) [d]				
	M (*SD*)	*M* (*SD*)	*t*	*df*	*p*	*d*
Age (years)	42.22 (15.12)	26.08 (7.67)	6.970	95	.001	1.346
Number of categories achieved	5.47 (1.29)	5.65 (1.02)	.759	95	.449	-.154
Perseverative errors	11.55 (9.45)	10.26 (7.05)	.765	95	.445	.154
% Conceptual level responses	71.49 (18.73)	74.31 (13.90)	.855	95	.394	-.170
Trials to achieve 1st category	18.08 (12.94)	13.61 (5.74)	2.341	95	.021	.446
Failure to maintain set	.77 (.86)	.75 (1.15)	.090	95	.928	.019

Note. [a] *n*= 36, [b] *n*= 79, [c] *n*= 36, [d] *n*= 61

Table 4. Percentile of Healthy and Depressed Subjects

	Depression [a]					Healthy [b]				
	10	25	50	75	90	10	25	50	75	90
Number of categories completed	1	3	5	6	6	2.7	6	6	6	6
Perseverative errors	36	29.5	17	10.2	6.7	25.6	17.7	7	5	4
% Conceptual level responses	23.4	42.1	57.0	65.9	83.1	34.9	59.4	79.1	86.9	88.2
Trials to achieve 1st category	69.5	31	14	11	10	35.5	20.7	13	11	10
Failure to maintain set	3.3	2	1	0	0	2	1	1	0	0

Note. [a] n= 36, [b] n= 36

Manuscrito III

Moniz, M., de Jesus, S. N., Viseu, J., Gonçalves, Pacheco, A., & Baptista, A. S. (2015). Planning dysfunction in non-psychotic unipolar depressed patients using a computerized version of the Tower of London task. *Europe's Journal of Psychology.* Manuscript Submitted for Publication. **SJR: 0.185**. ISSN: 1841-0413.

Title: Planning dysfunction in non-psychotic unipolar depressed patients using a computerized version of the Tower of London task.

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Abstract

Alterations in executive functioning are frequent in depressed patients, being common the appearance of planning difficulties. This study aimed to compare the performance of a sample of 40 non-psychotic unipolar depressed patients (26 women and 14 men, with a mean age of 44.15 years old [*SD* = 13.82]) with 40 healthy controls (24 women and 16 men, with a mean age of 42.05 years old [*SD* = 15.19]) using a computerized version of the Tower of London (TOL) task. Significant differences regarding extra moves and execution time between groups were found, with healthy controls outperforming depressed patients, who took significantly longer to complete the task. The variable age influenced clearly the results, showing a shared variance of 55% for both groups. The results allowed us to identify differences in performance between both groups, therefore this version of the TOL revealed itself a reliable alternative to assess planning, accessible to all clinicians.

Keywords: Unipolar Depression, Tower of London, Planning, Normative Data.

Introduction

Cognitive assessment in mental health contexts is a field of interest for clinical practice since it provides clinicians with a better understanding of patients and their competences for treatment (e.g., psychotherapy), as well as data for differential diagnosis.

In this regard, cases in which patients exhibit alterations in executive functioning (e.g., planning, set-shifting), recurrently associated with clinical features of non-psychotic unipolar depression, are common (Rogers et al., 2004; Wagner, Doering, Helmreich, Lieb, & Tadić, 2012).

Thus, it is important to understand the cognitive functioning of non-psychotic unipolar depressed patients, particularly concerning functions associated with executive functioning, being common in depression (moderate and severe) the occurrence of alterations in planning, often assessed using tests, such as the Tower of London (TOL) (Beats, Sahakian, & Levy, 1996; Elliott et al., 1996).

Planning consists in a process that involves many capacities employed, for instance, in the acts of identifying and assembling factors, such as skills, materials or other people, and organizing each step towards the pursue of a certain objective or intention (Lezak, Howieson, & Loring, 2004). It requires the subject the ability to conceive, in the present, changes in order to adequate him/herself objectively in relation to the future circumstances of a given environment. Planning also involves the ability to conceptualize and evaluate alternatives to make decisions, which takes the subject to order and prioritize the essential ideas to the development of a conceptual scheme with the purpose of carrying out a determined plan (Lezak, Howieson, & Loring, 2004). Given its relative complexity, planning often consists in a difficult task for those suffering from depression.

The TOL is a visuospatial planning task that recruits the dorsal prefrontal-parietal-striatal network (Van Den Heuvel et al., 2003; Wagner, Koch, Reichenbach, Sauer, & Schlösser, 2006). In major depressive disorder (MDD), performances in tasks requiring high planning demands, such as TOL, are characterized by a prefrontal hyperactivation.

Regarding the task itself, it seems that there are no differences between the manual and the computerized versions (McKinlay & McLellan, 2011), being however necessary for the second to keep up with the same level of difficulty as the first, so that planning

can be assessed (Kaller, Unterrainer, Rahm, & Halsband, 2004; Newman, Greco, & Lee, 2009). With the task employed in the current study, it was possible to obtain a mean of seven moves per problem, as recommended by Kaller and colleagues (2011).

The objective of this study was to compare the performance of a clinical sample of non-psychotic unipolar depressed patients with adult healthy controls in a computerized version of the TOL, aiming also to present initial normative data in order to enable its clinical application, as well as its utilization in future research.

This study is important since it increases our knowledge on cognitive functioning of unipolar depressed patients (without any influence of depressive disorders with manic and psychotic symptoms [e.g., bipolar and schizoaffective]), as well as provides initial normative data for its clinical use.

Method

Participants

Both studied samples, experimental and control groups, were comprised of 40 subjects each. The experimental (patients') group was composed of 26 women and 14 men, with a mean age of 44.15 years old (*SD* = 13.82) and a mean of 8.80 (*SD* = 3.70) years of education. The participants from this group were recruited in the city of Faro (Portugal), more precisely from the Department of Psychiatry and Mental Health of Algarve Hospital (a state owned entity). With analogous characteristics, control group comprised 24 women and 16 men, with a mean age of 42.05 years old (*SD* = 15.19) and a mean of 9.37 (*SD* = 3.40) years of education. Patients and controls did not differ significantly regarding gender (χ^2 = .213, *df* = 1, *p* = .644), age (*t* = .647, *df* = 78, *p* = .520, *d* = .144), and education (*t* = -.723, *df* = 78, *p* = .472, *d* = -.160).

Statistically, participants were divided into three age groups: (a) 17-34; (b) 35-49; and (c) more than 50 years. Regarding education, participants were also divided into three groups: (a) up to 6 years of education; (b) 9 years of education; and (c) 12 and more years of education. We only considered the completed cycles of education (i.e., 4th grade, 6th grade, 9th grade, 12th grade, and university), but then, only three groups were considered, since there were very few elements with 4 years of education, as well as with higher education. All participants were Caucasians and Portuguese speakers.

Measures

A computerized version of the TOL (described in detail in a recent study by Piper et al., 2012), from the Psychology Experiment Building Language (PEBL) (Mueller, 2013), a free access battery, was selected (Mueller & Piper, 2014). Stimuli were organized according to trial "A", proposed by Phillips, Wynn, Gilhooly, Della Sala, and Logie (1999).

The instructions were the following:

> You are about to perform a task called the "Tower of London". Your goal is to move a pile of disks from their original configuration to the configuration shown on the top of the screen. You can only move one

disk at a time. To move a disk, touch with the finger on the pile you want to move a disk off of, and it will move up above the piles. Then, touch on another pile, and the disk will move down to that pile.

The same computer running Microsoft Windows 8.1 was used with all subjects, with a touch screen in order to minimize the difficulties of older subjects in using a mouse or keyboard. The total amount of the extra movements was calculated by subtracting 48 (the amount of moves necessary to solve all the seven problems) to the total result provided by the software.

Procedures

All participants were assessed individually, during the morning, by a psychologist specifically certified for the purpose (Ahonen, Dunham, & Getty, 2012; Anderson, Deane, Lindley, & Loucks, 2012).

Each participant completed a health and demographic questionnaire and depression diagnoses were confirmed through the MINI (Mini International Neuropsychiatric Interview) (Sheehan et al., 1997), the BSI (Brief Symptom Inventory) (Canavarro, 2007), and the Hamilton Depression Rating Scale for Depression (HAM-D – 17-item) (Sousa, Lopes, & Vieira, 1979). Exclusion criteria were substance abuse, current or prior history of bipolar disorders, schizophrenia, major psychosis, dementia and neurologic disease, including head injury involving loss of consciousness. To discard malingering, Rey 15-Item Memory Test (15-IMT) was used (Simões et al., 2010).

This study was approved by the Algarve Hospital's Ethics Committee, in conformity with the Helsinki declaration. After being provided with all the information about the study, all participants signed an informed consent statement.

All analyzes were conducted using the Statistical Package for the Social Sciences (SPSS), version 20.0. The level of significance was set at $p < .05$.

Results

We found statistically significant differences between unipolar depressed patients and controls regarding movements (t = 7.129, df = 78, p = .000, d = 1.595) and execution time (t = 2.811, df = 78, p = .006, d = .628) (Table 1).

Table 1

One of this study's main variables was age. A one-way analysis of variance (*ANOVA*) showed age differences concerning execution time in both, experimental (F(2,37) = 14.32, p = .001, η_p^2 =.436) and control groups (F(2,37) = 16.15, p = .001, η_p^2 =.466). Controls showed a strong positive correlation between age and execution time (r(40) = .743, p = .001), and a high shared variance was also verified (R^2 = .552, F(1, 38) = 46.81, p = .001). Similar results were found in the patients' group regarding the magnitude and direction of the correlation (r(40) = .743, p = .001), as well as the shared variance (R^2 = .552, F(1, 38) = 46.80, p = .001).

There was, however, a negative correlation between age and education in both, patients' group (r(40) = .344, p = .030) and controls (r(40) = .315, p = .048), for that reason results concerning education were not taken into account.

Discussion

Differences between patients' group and controls were found concerning the total result, in conformity with previous research (e.g., Beats et al., 1996; Elliott et al., 1996) but contradicting Stordal and colleagues (2004) study results.

As in previous studies, the influence of the variable age was evident in performance (De Luca et al., 2003; Korkman, Kemp, & Kirk, 2001; Malloy-Diniz et al., 2008; Paula, Neves, Levy, Nassif, & Malloy-Diniz, 2012; Piper et al., 2012), given that, with regard to the execution time, we were able to identify a statistically significant difference concerning age, with older subjects (over 50 years old) taking more time to complete the task, which was expected and may be related to cognitive loss associated with aging, affecting both executive and motor functioning.

As far as the influence of gender is concerned, performance results in tasks such as TOL have shown little consistency. In spite of Boghi and colleagues (2006) suggestion that there are distinct functioning strategies in the way the task is performed, with males having more trust in visuospatial abilities and females in executive processing, these researchers did not find significant differences, as in Paula and colleagues (2012) study and in the current one.

There are studies that, on the contrary, have clearly identified differences regarding gender (De Luca et al., 2003; Dias & Seabra, 2012). Thus, further research, especially with wider samples, is needed in order to clarify this matter.

Nevertheless, the results obtained in this study are of added relevance because we tried to isolate individuals with non-psychotic unipolar depression, excluding psychotic and bipolar pathologies liable to influence overall results, since such patients have a distinct cognitive functioning compared to non-psychotic unipolar depressed subjects. Although this effort of circumscribing the study to non-psychotic unipolar depressed subjects ended up by limiting somehow the sample extension, it allowed a more precise analysis of the assessed depressive symptoms.

The main contribution of this study was to present initial normative data for this test (Table 2), hoping to help clinicians with future applications of the TOL task (being it a crucial tool to assess planning abilities of depressive patients) and, based on these data,

to enable them to adapt therapeutic techniques (e.g., psychotherapy or cognitive remediation therapy) in order to improve the recovery and life quality of their patients.

Table 2

In addition to the version used in this study, the PEBL test battery has already available various free-access versions of TOL, namely those by Shallice (1982), Fimbel, Lauzon, and Rainville (2009), the TOL-R version by Schirman, Welsh, and Retzlaff (1999), the TOL-DX version by Culbertson and Zillmer (1998) and trials A, B, and C by Phillips et al. (1999).

The main limitation of this study was the sample size, regarding both patients and health controls, which prevented us from validating more clearly normative data for TOL. Hence, we recommend that future research attempts to compare a wider number of subjects, integrating more homogeneous samples concerning age groups.

The correlation between age and education that was verified highlighted the difficulty of using the education variable, because nowadays, in Portugal, the elderly population has lower levels of education.

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Table 1. Descriptive Statistics (N = 80)

	Extra Moves				Time			
	Depressed [a]		Healthy [b]		Depressed [a]		Healthy [b]	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age								
17-34	20.37	6.94	14.07	4.94	212.5	60.3	211.8	74.0
35-49	25.85	6.36	12.85	4.52	379.9	117.2	274.6	73.3
50+	21.91	7.42	14.15	6.47	496.6	141.1	404.5	114.4
F	2.359		.252		14.320		16.151	
p	.109		.779		.000		.000	
η_p^2	.113		.013		.436		.466	
Education (grades)								
$\leq 6^{th}$	24.68	5.81	14.54	6.75	462.2	125.4	377.5	154.2
9^{th}	22.72	8.77	14.00	4.91	381.1	162.5	292.0	89.8
$\geq 12^{th}$	22.92	7.19	12.53	4.38	282.4	120.2	233.3	73.1
F	.324		.473		6.539		5.550	
p	.725		.627		.004		.008	
η_p^2	.017		.025		.261		.231	
Gender								
Female	22.96	7.33	13.70	5.64	363.0	136.4	316.7	117.1
Male	24.71	6.55	13.62	4.78	415.8	174.7	265.9	115.2
t	-.747		.049		-1.058		1.357	
p	.460		.962		.297		.184	
d	-.251		.015		-.336		.437	
Total Score	23.57	7.03	13.67	5.25	381.4	150.8	296.4	117.6
t	7.129				2.811			
p	.000				.006			
d	1.595				.628			

Note. [a] n= 40, [b] n= 40

Table 2. Percentile of Healthy and Depressed Subjects

	Extra Moves		Time	
Percentile	Depression [a]	Healthy [b]	Depression [a]	Healthy [b]
5	38.70	20.95	644.290	561.905
10	32.80	19.00	599.993	475.251
25	28.00	18.00	498.543	376.869
50	23.00	14.00	370.529	276.343
75	19.00	10.00	273.505	206.210
90	15.00	8.00	161.276	157.711
95	10.20	4.10	154.365	116.488

Note. [a] *n*= 40, [b] *n*= 40

Manuscrito IV

Moniz, M., de Jesus, S. N., Gonçalves, E., Pacheco, & A. Viseu, J. (2015). Decision-making in adult unipolar depressed patients and healthy subjects: Significant differences in Net Score and in non-traditional alternative measures. *Europe's Journal of Psychology*. Manuscript Submitted for Publication. **SJR: 0.185**. ISSN: 1841-0413.

Title: Decision-making in adult unipolar depressed patients and healthy subjects: Significant differences in Net Score and in non-traditional alternative measures.

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Abstract

Alterations in executive functioning are frequent in depressive patients. One clinical characteristic of depression is difficulty and slowness in decision-making. This study aimed to compare the performance of a group of 30 non-psychotic unipolar depressed subjects (22 women and 8 men, with a mean age of 42.20 years old [*SD* = 13.49]) to 30 healthy controls (20 women and 10 men, with a mean age of 41.43 years old [*SD* = 15.18]) in a version of the Iowa Gambling Task (IGT) from the Psychology Experiment Building Language (PEBL). Significant differences between depressed patients and healthy controls in traditional Net Score measures as well as in various alternative metrics (not included in the commercial version of IGT) were verified.

Keywords: Unipolar Depression, Iowa Gambling Task (IGT), Decision-making, Normative Data.

Introduction

Iowa Gambling Task (IGT) (Bechara, Damasio, Damasio, & Anderson, 1994) was developed with the purpose of simulating real-life judgment alterations, allowing to assess the emotions associated with decision-making in patients suffering damage to the orbitofrontal cortex (OFC). During the task, subjects perform a series of 100 selections from a group of four decks of cards (A, B, C and D), resulting the selection in a fixed monetary reward and, occasionally, in monetary losses. Yielding fixed rewards of 100$ for each choice, decks A and B are classified by Bechara et al. (1994) as "disadvantageous" because, in the long run, punishments surpass rewards; on the contrary, decks C and D, despite yielding rewards of half of that amount (50$ for each choice), are "advantageous" in the long run once rewards exceed punishments.

This study used a IGT version from the Psychology Experiment Building Language (PEBL) (Mueller, 2013), a free access battery, following the application indications of Areias, Paixão, and Figueira (2013). The classical 100 trials were performed, complying with changes of original instructions (Bechara, Damasio, Damasio, & Lee, 1999), embedded in the application. According to Bechara (2000), in initial studies, subjects tended to think they could never win the game because they had the impression that reward and punishment schedules were generated by the computer. In the current study, subjects were therefore informed that there were decks better than others and that cards were in a predefined order (and then not likely to be changed by the computer).

Decision-making corresponds to the cognitive processes involved in reaching a decision, allowing the adoption of a flexible behavior aimed toward a goal or the completion of a task in a dynamic environment. Impairments in decision-making are a main characteristic of many psychiatric pathologies, such as affective disorders, being difficulty and slowness in decision-making a clinical feature of depression (Clark & Robbins, 2009), and therefore, in IGT, depressed subjects are usually outperformed by controls (Cella, Dymond, & Cooper, 2010). However, some authors suggest that alterations in decision making are only typical of mania (bipolar disorder) (Chamberlain & Sahakian, 2006; Murphy et al., 2001) and that lower results in depression are due to psychomotor alterations, entailing a prolonged deliberation time, rather than impairment in decision-making (Clark & Robbins, 2009).

Regarding performance assessment, in addition to a conventional calculation (CD-AB, trials 1-100), we replicated other alternative measures (Gansler, Jerram, Vannorsdall, & Schretlen, 2011), particularly D-A, as well as two measures which exclude the first trials (CD-AB trials 21-100; CD-AB trials 41-100) in which choices are made without an explicit knowledge of reward and punishment contingencies (Areias et al., 2013).

The purpose of this study was to compare the performance of a clinical sample of non-psychotic unipolar depressed subjects to adult healthy controls in a free version of IGT. Another objective was to provide initial normative data in order to allow its application in clinical contexts and future research. According to the literature, we hypothesized that depressed subjects would perform more poorly in IGT compared to healthy controls.

Methods

Participants

Both studied samples, experimental and control groups, were comprised of 30 subjects each. The experimental (patients') group was composed by 22 women and 8 men, with a mean age of 42.20 years old (*SD* = 13.49), a mean of 8.50 (*SD* = 3.57) years of education and an age range of 17-67 years old. The participants from this group were recruited in the city of Faro (Portugal), more precisely from the Department of Psychiatry and Mental Health of Algarve Hospital (a state owned entity). With analogous characteristics, healthy controls comprised 20 women and 10 men, with a mean age of 41.43 years old (*SD* = 15.18), a mean of 10.03 (*SD* = 3.59) years of education and an age range of 17-67 years old. Patients and controls did not differ significantly regarding gender ($\chi 2$ = .317, *df* = 1, *p* = .573), age (*t* = .207, *df* = 58, *p* = .837, *d* = .053), and education (*t* = -1.655, *df* = 58, *p* = .099, *d* = -.427). All participants were Caucasians and Portuguese speakers.

Materials

The computerized Iowa Gambling Task (Mueller, 2013), a free software from PEBL Test Battery (Mueller & Piper, 2014), similar to the commercial version of IGT from PAR (Psychological Assessment Resources), and a valid measure of decision-making (Parkhurst, Gelety, Greenhalgh, & Birkett, 2014), was performed.

The same computer running Microsoft Windows 8.1 was used with all subjects, with a touch screen in order to minimize the difficulties of older subjects in using a mouse or a keyboard.

Procedures

Each participant completed a health and demographic questionnaire and depression diagnoses were confirmed through the MINI (Mini International Neuropsychiatric Interview) (Sheehan et al., 1997) and the BSI (Brief Symptom Inventory) (Canavarro, 2007). Exclusion criteria were current or prior history of bipolar

disorders, schizophrenia, major psychosis, substance abuse, dementia and neurologic disease, including head injury involving loss of consciousness. To discard malingering, Rey 15-Item Memory Test (15-IMT) was used (Simões et al., 2010).

This study was approved by the Algarve Hospital's Ethics Committee, in conformity with the Helsinki declaration. After being provided with all the information about the study, all participants signed an informed consent statement.

All analyzes were conducted using the Statistical Package for the Social Sciences (SPSS), version 20.0. The level of significance was set at $p < .05$.

Results

Differences between total scores for depressed subjects and healthy controls in general performance (Net total score t = -3.852, df = 58, p = .001, d = -.994) and most alternative metrics ((CD-AB Trials 1-40) (t = -.2.873, df = 100, p = .005, d = -.569); (CD-AB Trials 41-100) (t = -.2.873, df = 100, p = .005, d = -.569); (CD-AB Trials 21-100) (t = -.2.873, df = 100, p = .005, d = -.569); (C-B Trials 1-100) (t = -.2.873, df = 100, p = .005, d = -.569); (D-A Trials 1-40) (t = -.2.873, df = 100, p = .005, d = -.569); (D-A Trials 1-100) (t = -.2.873, df = 100, p = .005, d = -.569)) were found (Table 1).

Table 1

In terms of the influence of demographic variables, a one-way analysis of variance (*ANOVA*) only showed significant differences regarding age groups in healthy subjects (F(2,27) = 9.97, p = .001, η_p^2 =.425), with a shared variance of 33% in performance time (R^2=.339, F(1,28) = 14.372, p = .001).

Discussion

As in Cella, Dymond, and Cooper's (2010) study, and in contrast to the results obtained by Smoski et al. (2008), there were differences concerning total results between depressed subjects and healthy controls. It was not possible to corroborate that alterations in decision-making are specific features of bipolar disorders (Murphy et al., 2001) because, in the current study, depressed patients were outperformed by controls even in alternative measures, particularly CD-AB trials 21-100 and CD-AB trials 41-100, that exclude the first trials which may be related to a higher difficulty or slowness in adapting to the rules of the game (Areias et al., 2013).This study's results reinforce the hypothesis that impairment in decision-making is not only specific to the maniacal state of bipolar patients, being also a main feature of affective disorders (Roiser, Rubinsztein, & Sahakian, 2009), which has been corroborated by studies based on functional neuroimaging that have shown differences in neural responses to feedback during decision-making between depressed patients and healthy controls (Steele, Kumar, & Ebmeier, 2007; Tavares et al., 2008).

The main contribution of this study was to present initial normative data for this test (Table 2), hoping to help clinicians with future applications of IGT, once it represents a crucial tool to assess decision-making in depressive patients, as well as in subjects who do not suffer from any mental disorder. The main limitation was the sample size, regarding both patients' group and health controls, which prevented us from validating more clearly normative data for IGT. Future research attempting to compare a wider samples is therefore recommended.

Table 2

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Table 1. Descriptive Statistics (N = 60)

	Depression [a]		Healthy [b]				
	Mean	*SD*	Mean	*SD*	*t*	*p*	*d*
Performance (CD-AB)							
Net 1 (Trials 1-20)	-2.33	3.71	-.20	5,23	-1.820	.074	-.469
Net 2 (Trials 21-40)	2.13	4.26	5.86	5.55	-2.919	.005	-.753
Net 3 (Trials 41-60)	3.96	5.43	8.60	6.32	-3.042	.004	-.787
Net 4 (Trials 61-80)	3.53	7.45	7.93	8.71	-2.101	.040	-.542
Net 5 (Trials 81-100)	3.66	7.53	9.93	7.60	-3.206	.002	-.828
Net total score	11.03	20.71	31.80	21.04	-3.852	.000	-.994
Alternative Metrics							
CD-AB (Trials 1-40)	.20	5,68	5.66	7.82	-3.321	.002	-.798
CD-AB (Trials 41-100)	11.16	17.20	26.46	18.08	-3.358	.001	-.867
CD-AB (Trials 21-100)	13.30	19.44	32.33	21.06	-3.636	.001	-.938
C-B (Trials 1-100)	-4.30	16.96	9.63	17.46	-3.134	.003	-.809
D-A (Trials 1-40)	2.36	3.49	4.86	3.52	-2.759	.008	-.713
D-A (Trials 41-100)	12.80	8.87	17.36	13.24	-1.569	.122	-.404
D-A (Trials 1-100)	14.96	8.93	22.23	14.52	-2.334	.023	-.603
Frequency							
Deck A	14.70	2.89	11.70	4.31	3.163	.003	.817
Deck B	29.80	10.43	22.36	8.19	3.068	.003	.793
Deck C	25.50	8.41	32.00	12.66	-2.342	.023	-.604
Deck D	29.66	8.13	33.93	12.71	-1.548	.127	-.400
Time	358.8	92.6	341.0	103.0	0.702	.486	.181

Note. [a] n= 30, [b] n= 30

Table 2. Percentile of Healthy and Depressed Subjects

	Net Total Score		
Percentile	Depression [a]	Healthy [b]	Time [c]
5	-29.25	-0.90	525.0
10	-15.60	6.40	498.7
25	-6.00	17.00	405.2
50	14.00	27.00	346.9
75	20.50	44.00	278.3
90	40.60	67.80	233.9
95	52.50	73.80	199.0

Note. [a] n= 30, [b] n= 30, [c] N= 60

Manuscript V

Moniz, M., de Jesus, S. N., Gonçalves, E., Viseu, J., Baptista, A. S., & Pacheco, A. (2015). Computerized Victoria Stroop Test in adult unipolar depressed patients and healthy subjects: Influence of age and gender. *Psychology*. Manuscript Submitted for Publication. ISSN-Print 2152-7180. ISSN-Online 2152-7199.

Title: Computerized Victoria Stroop Test in adult unipolar depressed patients and healthy subjects: Influence of age and gender.

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Abstract

Alterations in executive functioning are frequent in depressive patients, being common the appearance of difficulties in inhibitory control. This study aimed to compare the performance of 31 non-psychotic unipolar depressed subjects (22 women and 9 men, with a mean age of 43.81 years old [*SD* = 14.78]) to 31 healthy controls (21 women and 10 men, with a mean age of 42.77 years old [*SD* = 13.94]) in a computerized version of Victoria Stroop Test (VST), an instrument that assess the inhibitory control. Significant differences between depressed patients and healthy controls concerning time to complete dots, neutral words and color words, as well as in interference trial. A clear influence of the variable age in both groups was also identified, having older subjects (over 50 years old) exhibited slower performances, showing a shared variance between 40% and 55% regarding depressive subjects and between 31% and 55% concerning healthy controls.

Keywords: Unipolar Depression, Victoria Stroop Test (VST), Inhibitory Control, Normative Data.

Introduction

Inhibitory control is an important cognitive function associated with executive functioning and it is assessed with tasks such as Stroop (Miyake et al., 2000). Alterations in execution time (Gohier et al., 2009), as well as in interference (Harvey et al., 2004; Stordal et al., 2004), are common in depression. Concerning unipolar depressed patients, rostral anterior cingulate gyrus (rACG) and left dorsolateral prefrontal cortex (DLPFC) are involved in interference (Wagner et al., 2006).

This study utilized a computerized version of the Victoria Stroop Test (VST) that takes less time to be applied and can be found in public domain. According to literature (Gohier et al., 2009; Harvey et al., 2004; Stordal et al., 2004), we hypothesized that depressed patients would be outperformed by healthy controls and that younger subjects would perform faster in both groups, being execution time influenced by age. Performance of depressive patients tend to improve during the course of antidepressant treatment (Wagner, Doering, Helmreich, Lieb, & Tadić, 2012), however, in the current study, it was not possible to assess drug-free depressed subjects.

The current study aimed to compare the performance of a clinical sample of unipolar depressed patients with adult healthy controls in a computerized version of VST, and also provide initial normative data in order to allow its application in clinical contexts and future research.

The importance of this study will be to increase understanding on cognitive functioning of unipolar depressed patients (without any influence of depressive disorders with manic and psychotic symptoms [e.g., bipolar and schizoaffective]). Also, we hope it can provide initial normative data, in order to be a resource widely used by clinicians.

Method

Participants

Both studied samples, experimental and control groups, were comprised of 31 subjects each. The experimental (patients') group was composed of 22 women and 9 men, with a mean age of 43.81 years old (*SD* = 14.78), a mean of 8.32 (*SD* = 3.41) years of education and an age range of 17-67 years old. The participants from this group were recruited in the city of Faro (Portugal), more precisely from the Department of Psychiatry and Mental Health of Algarve Hospital (a state owned entity). With analogous characteristics, healthy controls comprised 21 women and 10 men, with a mean age of 42.77 years old (*SD* = 13.94), a mean of 9.67 (*SD* = 3.79) years of education and an age range of 17-67. Patients and controls did not differ significantly regarding gender ($\chi 2$ = .076, *df* = 1, *p* = .783), age (*t* = .278, *df* = 60, *p* = .782, *d* = .071) and education (*t* = -1.792, *df* = 60, *p* = .078, *d* = -.374).

Statistically, participants were divided into three age groups: (a) 17-39; (b) 40-49; and over 50 years old. All participants were Caucasians and Portuguese speakers.

Materials

A computerized VST (Mueller, 2013), from the Psychology Experiment Building Language (PEBL), a free access battery (Mueller & Piper, 2014) was used, as it is similar to the paper and pencil format (Troyer, Leach, & Strauss, 2006). The same computer running Microsoft Windows 8.1 and a keyboard were used with all subjects. Keys 1, 2, 3, and 4 were used to perform the selections. Instructions provided by Strauss, Sherman, and Spreen (2006) were followed for VST application.

Procedures

All participants were assessed individually, during the morning, by a psychologist specifically certified for the purpose (Ahonen, Dunham, & Getty, 2012; Anderson, Deane, Lindley, & Loucks, 2012).

Each participant completed a health and demographic questionnaire and depression diagnoses were confirmed through the MINI (Mini International Neuropsychiatric Interview) (Sheehan et al., 1997) and the BSI (Brief Symptom Inventory) (Canavarro, 2007). Exclusion criteria were current or prior history of bipolar disorders, schizophrenia, major psychosis, substance abuse, dementia, and neurologic disease, including head injury involving a loss of consciousness. To discard malingering, Rey 15-Item Memory Test (15-IMT) was used (Simões et al., 2010).

This study was approved by the Algarve Hospital's Ethics Committee, in conformity with the Helsinki declaration. After being provided with all the information about the study, all participants signed an informed consent statement.

All analyzes were conducted using the Statistical Package for the Social Sciences (SPSS), version 20.0. The level of significance was set at $p < .05$.

Results

Differences between total scores of depressed subjects and healthy controls in the trials time to complete dots (t = -3.852, df = 58, p = .001, d = -.994), time to complete neutral words (t = -3.852, df = 58, p = .001, d = -.994), time to complete color words (t = -3.852, df = 58, p = .001, d = -.994) and interference (t = -3.852, df = 58, p = .001, d = -.994) were found (Table 1).

Table 1

A one-way analysis of variance (*ANOVA*) showed significant group differences regarding age (depression dots: $F(2,28) = 9.65$, $p = .001$, $\eta_p^2 = .408$; neutral words: $F(2,20) = 9.33$, $p = .001$, $\eta_p^2 = .410$; color words: $F(2,13) = 11.10$, $p = .001$, $\eta_p^2 = .452$; interference: $F(2,17) = 5.35$, p = .015, $\eta_p^2 = .281$ *vs.* healthy Dots: $F(2,17) = 11.39$, $p = .001$, $\eta_p^2 = .431$; neutral words: $F(2,28) = 6.15$, $p = .006$, $\eta_p^2 = .305$; color words: $F(2,28) = 6.31$, $p = .005$, $\eta_p^2 = .311$), having older subjects (over 50 years old) exhibited slower performances. *T*-tests demonstrated significant group differences concerning gender regarding only healthy subjects in trials time to complete dots (t = 2.380, df = 29, p = .024, d = .967) and neutral words (t = 2.607, df = 29, p = .014, d = 1.062).

We found a shared variance between 40% and 44% concerning execution time in depressed subjects (dots: R^2=.435, $F(1,29) = 22.28$, $p = .001$; neutral words: R^2=.448, $F(1,29) = 23.53$, $p = .001$ and color words: R^2=.408, $F(1,29) = 20.02$, $p = .001$) and between 31% and 55% in healthy subjects (dots: R^2=.557, $F(1,29) = 36.52$, $p = .001$; neutral words: R^2=.482, $F(1,29) = 27.03$, $p = .001$ and color words: R^2=.314, $F(1,29) = 13.30$, $p = .001$).

Discussion

As in previous studies, there were no significant differences in execution time (cognitive slowness) between depressive subjects and healthy controls (Gohier et al., 2009), despite the first having exhibited a slower performance.

Regarding interference (inhibitory control), corroborating previous research (Harvey et al., 2004; Stordal et al., 2004), a difference between groups was found.

Concerning aging effects, older subjects (over 50 years old) took more time to perform each trial, therefore the influence of the variable age, previously reported in literature (Mitrushina, Boone, Razani, & D'Elia, 2005; Troyer et al., 2006), was corroborated by the current study.

One of this study's main contributions is sharing statistical data collected in clinical context to allow other clinicians to use initial normative data (Table 2). It is of outmost significance since VST is an instrument that is not covered by copyright law and of mandatory use to evaluate depressed patients. The main limitation was the size of the sample concerning both patients and healthy controls, which prevented us from validating clearly normative data of this test. Future research comparing wider numbers of subjects and more homogeneous samples – particularly regarding age groups – is therefore recommended.

Table 2

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Table 1. Descriptive Statistics (N = 62)

	Time						Interference	
	Dots		Neutral Words		Color Words			
	D [a]	H [b]	D [a]	H [b]	D [a]	H [b]	D [a]	H [b]
	M	*M*	*M*	*M*	*M*	*M*	*M*	*M*
Age								
17-39	54.9	45.8	41.1	39.7	56.2	48.0	2.4	0.75
40-49	99.6	63.5	87.0	44.9	103.6	54.6	3.1	0.75
+50	116.0	89.3	97.0	65.2	183.5	86.0	6.7	2.0
F	9.650	11.396*	9.337*	6.152	11.104*	6.316	5.352*	2.945
p	.001	.001	.001	.006	.001	.005	.015	.069
η_p^2	.408	.431	.410	.305	.452	.311	.281	.174
Gender								
Male	85.7	49.7	78.1	37.0	108.4	49.0	4.2	1.0
Female	90.4	73.7	72.2	56.3	114.3	69.9	3.9	1.3
t	.284	2.380	-.374	2.607	.182	1.806	-.187	.613
p	.778	.024	.711	.014	.857	.081	.853	.545
d	.118	.967	-.150	1.062	.084	.718	-.084	.203
Total	89.0	65.8	74.0	50.1	112.6	63.2	4.0	1.2
t	2.551		2.991		3.213		4.015	
p	.013		.004		.003		.000	
d	.647		.762		.841		1.039	

Note. Educ. = Education, D = Depressive, H = Healthy, * Brown-Forsythe, [a] *n*= 31, [b] *n*= 31

Table 2. Percentile of Healthy and Depressed Subjects

	Time						Interference	
	Dots		Neutral Words		Color Word			
	D [a]	H [b]	D [a]	H [b]	D [a]	H [b]	D [a]	H [b]
5	184,69	131,79	153,85	101,94	352,39	138,26	12,4	4
10	167,87	107,04	143,16	76,66	205,83	118,35	9	4
25	105,80	75,65	94,16	59,97	138,90	75,59	6	3
50	78,20	61,04	65,37	48,16	106,25	55,67	4	0
75	58,79	49,09	41,68	39,25	49,07	41,34	1	0
90	44,45	32,06	30,28	23,23	37,84	29,37	0	0
95	36,11	29,78	28,57	19,59	33,59	22,25	0	0

Note. D = Depressive, H = Healthy, [a] *n*= 31, [b] *n*= 31

Manuscript VI

Moniz, M., de Jesus, S. N., Gonçalves, E., Viseu, J., Pacheco, A., & Moreira, S. (2015). Portuguese version of simple Go/No-go Task: Influence of age in attention and response inhibition reaction time. *Psychology*. Manuscript Submitted for Publication. ISSN-Print 2152-7180. ISSN-Online 2152-7199.

Title: Portuguese version of simple Go/No-go Task: Influence of age in attention and response inhibition reaction time.

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Abstract

Executive functions (EFs) are essential in human functioning and therefore an important field of study in neuropsychology. One of the most common disorders concerning EFs is the alteration in response inhibition, fundamental to an adequate behavior. This study aimed to show the initial normative data of 35 healthy subjects (22 women and 13 men, with a mean age of 42.60 years old [*SD* = 14.36]) in a free version of the Go/No-go task. We were able to identify a clear influence of the variable age in reaction time concerning response inhibition and attention.

Keywords: Go/No-go task, Normative Data, Response Inhibition.

Introduction

Executive functions (EFs) refer to cognitive competences that allow the subject to determine objectives, find new ways of reaching them, trying to adapt him/herself to various circumstances along that path. An useful way of assessing executive functioning, as well as the severity of executive dysfunctions, being response inhibition one of the most common, involves the utilization of neuropsychological measures (Burgess & Alderman, 2003).

The Go/No-go task is one of the most applied measures to assess response inhibition. Between the two paradigms of Go/No-go tasks, "simple" and "complex", we find the first to be preferable. On one hand, it does not require an increased working memory, as "complex" Go/No-go tasks do, not relevant for the purpose of our study. Also, it features, the use of pre Supplementary Motor Area (pre-SMA), essential to the se-lection of an adequate behavior, needed to select an appropriate response or to inhibit an inappropriate one (Simmonds, Pekar, & Mostofsky, 2008).

Given the importance of this mechanism for clinical practice and the current lack of instruments for its assessment, this study aimed to present the first results regarding normative data of a simple Go/No-go task from the Psychology Experiment Building Language (PEBL) (Mueller, 2013), a free access battery.

Method

Participants

Our sample comprised 35 healthy subjects, 22 women and 13 men, with a mean age of 42.60 years old (*SD* = 14.36), a mean of 9.74 (*SD* = 3.76) years of education and an age range of 17-67 years old, recruited from advertisements. All participants were Caucasians and Portuguese speakers.

Materials

A computerized Go/No-go Task (Mueller, 2013), a free software from PEBL Test Battery (Mueller & Piper, 2014), was performed by every subject, using the same portable computer running the Microsoft Windows 8.1 and an external keypad connected to it.

Procedures

Each participant completed a health and demographic questionnaire which included the MINI (Mini International Neuropsychiatric Interview) (Sheehan et al., 1997) and the BSI (Brief Symptom Inventory) (Canavarro, 2007). Exclusion criteria were current or prior history of mental health disorders, dementia, substance abuse and neurologic disease, including head injury involving a loss of consciousness. To discard simulation, Rey 15-Item Memory Test (15-IMT) was used (Simões, Sousa, & Duarte, 2010).

This study was approved by the Algarve Hospital's Ethics Committee, in conformity with the Helsinki declaration. After having been provided with all the information about the study, all participants signed an informed consent statement.

All analyzes were conducted using the Statistical Package for the Social Sciences (SPSS), version 20.0. The level of significance was set at $p < .05$.

Results

We found differences between age groups in accuracy (number of correct responses and number of errors) and in reaction time, with significant effects of age in these results (Table 1).

Table 1

A one-way analysis of variance (*ANOVA*) showed significant group differences concerning effects of aging, with older patients performing overall more poorly regarding reaction time (P-Go: $F(2,19.8) = 9.71$, $p = .001$; R-No-go: $F(2,32) = 5.57$, $p = .008$; R-Go: $F(2,20.5) = 7.93$, $p = .003$), accuracy (Nº corrects: $F(2,19.9) = 3.98$, $p = .035$; % corrects: $F(2,19.7) = 3.90$, $p = .037$) and total of errors (Nº errors: $F(2,19.9) = 3.98$, $p = .035$; % errors: $F(2,19.7) = 3.90$, $p = .037$).

A shared variance of 28% and 42% was found in reaction time regarding response inhibition (R-No-go, commission errors: $R^2=.289$, $F(1,33) = 13.34$, $p = .001$) and attention (R-Go, omission errors: $R^2=.422$, $F(1,33) = 24.09$, $p = .001$), respectively (Table 2).

Table 2

Discussion

According to previous reports (Votruba & Langenecker, 2013), the influence of aging effects in reaction time was evident, corroborating the importance of motor skills to task performance.

As Go/No-go task represents a crucial instrument to assess response inhibition, the main contribution of this study was the presentation of initial normative data (Table 3), with the purpose of helping clinicians with future applications of this test. Its main limitation concerns the sample size, which was not wide enough to validate normative data more clearly. Future research should compare larger numbers of subjects and samples should comprise more homogeneous groups, particularly regarding age.

Table 3

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Table 1. Descriptive Statistics (N = 35)

	Total Score [a]		Age Group						
			17-39 [b]		40-49 [c]		over 50 [d]		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*p-value*
Errors									
P-Go	3.42	7.48	.57	1.01	3.09	8.12	7.80	10.13	.105*
R-No-go (Commission Errors)	5.48	3.33	4.42	2.20	5.18	2.60	7.30	4.69	.106
R-Go (Omission Errors)	.40	.77	.28	.61	.36	.67	.60	1.07	.622
P-No-go	1.88	2.28	1.64	1.98	1.54	1.50	2.60	3.27	.516
Percent.									
P-Go	97.32	5.84	99.55	.79	97.58	6.35	93.95	7.91	.105*
R-No-go (Commission Errors)	82.85	10.42	86.16	6.90	83.80	8.12	77.18	14.66	.106
R-Go (Omission Errors)	98.75	2.42	99.10	1.91	98.86	2.10	98.12	3.35	.622
P-No-go	98.52	1.78	98.71	1.55	98.79	1.17	97.96	2.55	.516
Reaction times (ms)									
P-Go	525.65	99.29	455.10	31.46	543.15	110.99	605.16	83.58	.001*
R-No-go (Commission Errors)	448.17	82.28	405.95	41.03	448.51	86.87	506.90	90.29	.017
R-Go (Omission Errors)	547.15	75.45	501.22	32.76	547.75	68.70	610.79	83.24	.003*
P-No-go	486.33	68.14	489.16	57.36	439.11	37.76	529.77	81.59	.061
Total									
Accuracy (nº)	308.8	10.07	313.07	4.19	309.81	10.36	301.70	12.38	.035*
% Accuracy	96.48	3.13	97.78	1.24	96.81	3.23	94.28	3.86	.037*
Errors (nº)	11.20	10.07	6.92	4.19	10.18	10.36	18.30	12.38	.035*
% Errors	3.51	3.13	2.21	1.24	3.18	3.23	5.71	3.86	.037*

Note. [a] n= 35, [b] n= 14, [c] n= 10, [d] n= 10, * Brown-Forsythe

Table 2. Percentage of Variance Accounted for by Age

	Healthy [a] (% of variance)
	Age
Response Inhibition (R-No-go)	
Errors	8
RT (ms)	28 [1]
Attention (R-Go)	
Errors	3
RT (ms)	42 [1]

Note. [a] n= 35; [1] $p \leq .001$

Table 3. Percentile of Healthy Subjects

	Healthy [a]				
	10	25	50	75	90
Response Inhibition (R-No-go)					
Errors	10.00	7.00	5.00	3.00	2.00
Percent	68.75	78.13	84.37	90.62	93.75
RT (ms)	601.58	464.75	419.20	389.62	369.66
Attention (R-Go)					
Errors	2	1	0	0	0
Percent	93.75	96.87	100.00	100.00	100.00
RT (ms)	663.14	572.80	522.59	495.87	474.02
Total					
% Accuracy	90.81	95.93	97.81	98.75	99.02
% Errors	9.18	4.06	2.18	1.25	.97

Note. [a] *n*= 35

Manuscrito VII

Moniz, M., de Jesus, S. N., Gonçalves, E., Brás, M. S. V., & Viseu, J. (n.d.). The influence of response inhibition in cognitive functioning of non-psychotic unipolar depressed suicide attempters. *Journal of Affective Disorders*. **IF: 3.383.** ISSN: 0165-0327.

Title: The influence of response inhibition in cognitive functioning of non-psychotic unipolar depressed suicide attempters.

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Abstract

Background: Depression represents a risk factor for suicide, however, little is known about the actual link between depressive symptomatology and suicide risk. Deficits in executive functions have been associated with suicidal behavior and are believed to underlie cognitive rigidity among suicidal individuals, favoring a dichotomous thinking preventing them from conceiving alternative solutions to problems. Methods: We compared 20 non-psychotic unipolar depressed suicide attempters (18 women and 2 men, with a mean age of 42.22 years old [*SD* = 15.12]) to 20 matching depressed non-attempters (13 women and 7 men, with a mean age of 44.28 years old [*SD* = 14.78]), and 20 healthy controls (13 women and 7 men, with a mean age of 43.25 years old [*SD* = 14.88]), to further investigate possible differences in neuropsychological performance. Depressed subjects were controlled for current suicidal ideation and neuropsychological specificity was assessed by a range of measures of executive functioning, memory and processing speed. Results: Depressed groups were outperformed by healthy controls, but depressed attempters did not show to be more impaired than depressed non-attempters on any measure except for Go/No-go (response inhibition), and performed better than non-attempters on TOL (planning). Conclusions: Depressed attempters cannot be clearly distinguished by a deficit in cognitive inhibition, because they exhibited impairment in response inhibition but not in inhibitory control. Our results challenge the presence of a cognitive rigidity among suicidal subjects.

Keywords: Depression, Suicide Behavior, Cognitive Functioning, Planning, Executive Dysfunction, Response Inhibition.

1. Introduction

Suicide is a global phenomenon. According to the World Health Organization (WHO, 2015), every year, more than 800.000 people complete suicide. In 2012, it represented the second leading cause of death among 15-29 year-olds worldwide. Aiming for a better understanding of suicidal behavior and processes inherent to suicidal acts, known as suicidal crises, becomes therefore a priority. These complex processes may last from a few minutes to many months, starting with strong painful feelings – usually referred to as "psychological/psychic pain" (Jollant et al., 2011; Keilp et al., 2012b) –, such as guilt, remorse, shame and anger, culminating in extreme despair, often leading to the occurrence and entertainment of suicidal thoughts and, sometimes, to an actual attempt (Jollant et al., 2011; Richard-Devantoy et al., 2012a). During a crisis, suicide may be triggered by external causes (Heikkinen et al., 1994; Jollant et al., 2011), such as loss of a loved one, relationship break-ups, financial problems, social or relational difficulties, isolation, troubles at work, discrimination and experiencing violence or abuse. Yet, it may also occur without the clear presence of an external trigger (Macdonald, 2006), however, other possible causes still remain ill-defined.

Mental disorders – particularly depression and alcohol abuse – correspond to one of the main risk factors for suicide (Schneider et al., 2006; WHO, 2015). Arsenault-Lapierre and colleagues (2004) meta-analysis has shown evidence of mental disorders in 87.3% of suicide completers, of which 95% met criteria for affective disorders. Individuals suffering from such disorders, whether or not past attempters, are still stigmatized by societies (WHO, 2015), consequently many tend to underrate or conceal symptoms, when aware of them, preferring to isolate themselves rather than to seek help. This fact has been contributing to hinder early diagnoses and the already difficult pursuit of an adequate response and control. Thus, it is increasingly mandatory for healthcare professionals trying to identify suicide causes among these patients, in order to predict and prevent it.

Nevertheless, little is known about the real association between depression and suicide risk. Jollant and colleagues (2011), for instance, have posited that the pathological processes underlying a crisis usually occur during an acute stage of the illness. Keilp and colleagues (2012b), in contrast, have suggested that the link between suicide risk and

severity of depression is merely modest. Furthermore, in depression, the relation between suicidal ideation and suicide attempt remains, likewise, controversial. Whereas some depressed patients have never entertained suicidal thoughts or attempted suicide (Marzuk et al., 2005), more than half of them actually contemplate it and one-third of ideators commit it (Kessler et al., 1999). Consequently, although depression is considered a high risk factor for suicide (Lekka et al., 2006; Schneider et al., 2006), this may not be directly associated with the psychopathological condition itself, because ideation and act represent distinct stages of the suicidal process (Jollant et al., 2011). Alone, ideation is a weak predictor of attempt (Jollant et al., 2011; Marzuk et al., 2005). Recent epidemiological findings have suggested that depression is a better predictor of suicidal ideation rather than of suicidal acts (Nock et al., 2010). So, uncovering markers that could possibly allow distinguishing more clearly between these two stages of suicidal behavior assumes great significance for its early diagnosis, treatment and prevention.

Over the last years, from original works to evidence-based review articles, several studies have aimed at identifying neuroimaging and cognitive markers in clinical samples comprising patients with a history of suicide attempts and/or current suicidal ideation. As for the neuroanatomical underpinnings of suicidal behavior, a recent meta-analysis has identified the involvement of the ventrolateral prefrontal cortex (VLPFC) (including regions of the orbitofrontal cortex (OFC)), the anterior cingulate gyrus, the dorsomedial PFC (DMPFC), the dorsolateral PFC (DLPFC), as well as – albeit to a lesser extent – the amygdala and the medial temporal cortex (MTC) (Jollant et al., 2011). Some of these regions, namely the DLPFC, the anterior cingulate cortex (ACC) and the OFC, are believed to participate in basically all executive functions (EFs) (Rogers et al., 2004). EFs refer to cognitive competences that allow to determine objectives in ever-changing environments and find ways of reaching them, having to adapt oneself constantly to circumstances (Burgess & Alderman, 2003). According to previous reports, executive dysfunctions, which are different from other cognitive deficits common in depression, are linked to suicidal behavior (Jollant et al., 2011; Keilp et al., 2001, 2008, 2012a; King et al., 2000; Marzuk et al., 2005; Richard-Devantoy et al., 2012a, 2012b, 2014; Westheide et al., 2008). Corroborating most neuroimaging findings, regarding cognitive markers, research has found alterations in EFs of depressed suicide attempters (Jollant et al., 2011; Keilp et al., 2001, 2008, 2012a; Marzuk et al., 2005; Richard-Devantoy et al., 2012a; 2012b, 2014; Westheide et al., 2008), particularly concerning attention, problem-solving,

verbal fluency and mental flexibility, though these evidences are not always consistent across samples.

Richard-Devantoy and colleagues (2012a) review has found a high connection between depression and executive dysfunction, suggesting that both disorders may partake the same neuropsychological basis in respect to frontal dysfunction, which may trigger suicide risk. Additionally, that dysfunction may also be associated with an insufficiency in serotoninergic transmission, liable to provoke depression and suicidal behaviors (Richard-Devantoy et al., 2012a). Many of these alterations in EFs correspond to some of the most common markers already shown by depressed non-attempters, regardless of current suicidal ideation (Austin et al., 2001; Beats et al., 1996; Biginger et al., 2005; Braaten et al., 2006; Cella et al., 2010; Gohier et al., 2009; Kertzman et al., 2010; Lee et al., 2012; McDermott & Ebmeier, 2009; Richard-Devantoy et al., 2012a, 2012b, 2014; Rogers et al., 2004; Roiser et al., 2009; Stordal et al., 2004; Wagner et al., 2012). Moreover, Marzuk and colleagues (2005), and Westheide and colleagues (2008) have suggested that suicidal ideation itself may contribute to the aggravation of impairment in EFs, evoking another relevant question: does depressed mood interfere with executive performance? If so, rather than trait-related, some impairments may be due to the severity of depressive state (including potential suicidal ideation), therefore likely to be reversed after treatment. Lee and colleagues (2012) have attributed to clinical state impairments in psychomotor speed and memory functioning, whereas deficits in attention and EFs have been found to be persistent even with remission and consequently more prone to be trait-markers. According to Biringer and colleagues (2005), trait-related impairments are perhaps associated with inherent pathobiological mechanisms.

Nevertheless, these data are not consistent, hence how and to what extent does mood alone interfere with neuropsychological performance, if at all, represent, likewise, questions still unanswered.

Recently, many studies have specifically assessed samples of depressed suicide attempters, some comprising unipolar and bipolar subjects (e.g., Keilp et al., 2001, 2008; Marzuk et al., 2005), others including patients with comorbid personality disorders (e.g., Keilp et al., 2012a), but only a few focusing particularly on non-psychotic unipolar depressed patients (e.g., King et al., 2000; Richard-Devantoy et al., 2012b; Westheide et al., 2008).

King and colleagues (2000), Richard-Devantoy and colleagues (2012b) and Westheide and colleagues (2008) studies have measured the performance of non-psychotic unipolar depressed attempters on several neuropsychological measures. The first two have focused on older patients (more than 50, and more than 65 years old, respectively) and only the latter has controlled for current suicidal ideation. Concerning performance results on a range of neuropsychological tasks, King and colleagues (2000) have compared depressed suicide attempters to depressed non-attempters and observed effects of aging regarding mental sequencing and flexibility, but no significant differences between the two groups. On the contrary, Richard-Devantoy and colleagues (2012b) study's has shown that elderly depressed attempters performed more poorly than matching depressed non-attempters and healthy controls in three domains of cognitive inhibition, namely access to relevant information, suppression of no longer relevant information and restraint of cognitive resources to relevant information. Westheide and colleagues (2008) have found differences between depressed suicide attempters, with and without current suicidal ideation, and healthy controls. Moreover, their results have shown suicidal ideation to be related to more severe executive deficits, particularly in decision-making, learning capacity and inhibitory response, which may represent a sign of cognitive rigidity (Westheide et al., 2008).

This assumption, widely discussed in literature (Jollant et al., 2011; Keilp et al., 2008; Richard-Devantoy, 2012a), is in line with other reports (Keilp et al., 2001; Marzuk et al., 2005) whose results have suggested that suicidal behavior is related to cognitive rigidity or mental inflexibility. The link between cognitive rigidity and suicide risk relies on the thesis that suicidal subjects may experience serious difficulties in conceiving alternative solutions to problems, often seen as absolute dichotomies without any intermediate option, leading them to make stark choices culminating in deadly situations. However, the hypothesis that suicide attempters and/or suicidal ideators can be distinguished by the presence of such unique executive impairments is still far from being well established. King and colleagues (2000) study results, for instance, challenge it, once they have yielded no significant differences between depressed suicide attempters and non-attempters in any neuropsychological measures. So far, research have been able neither to characterize depressed suicide attempters by a specific cognitive profile (Westheide et al., 2008) nor to distinguish them clearly from depressed non-attempters, and the same applies to suicidal ideators in relation to non-ideators. Consistent findings

are still scarce in view of the various questions that remain unclear. More studies are therefore needed to contribute to a deeper understanding of suicidal behavior and its underlying processes that lead to suicidal acts, to prevent them more effectively.

The objective of the current study was to further investigate differences in neuropsychological performance between non-psychotic unipolar depressed suicide attempters, non-psychotic unipolar depressed non-attempters and healthy controls. Following King and colleagues (2000), Richard-Devantoy and colleagues (2012b), and Westheide and colleagues (2008), we circumscribed our clinical sample to non-psychotic unipolar depression, because, according to literature, cognitive functions of bipolar subjects are believed to be influenced in a distinctive manner (Stordal et al., 2004). Likewise, psychotic patients tend to exhibit more deficits (Stordal et al., 2004). Subjects who met criteria for the aforementioned conditions were then excluded. Patients were controlled for current suicidal ideation and other clinical parameters were applied to confirm diagnoses. We addressed neuropsychological specificity by including a vast array of neuropsychological measures, comprised of tests of executive functioning, memory and processing speed.

In light of previous reports, we hypothesized the following: (1) all depressed subjects would perform more poorly compared to non-patients; (2) depressed suicide attempters would exhibit more executive deficits, in general, than depressed non-attempters and healthy controls; (3) the performance of past suicide attempters would exhibit more evidence of the presence of cognitive rigidity than that of both control groups.

2. Methods

2.1. Participants

All three studied samples, experimental (depressed suicide attempters, with at least one past suicide attempt, and non-attempters patients') and control groups, were comprised of 20 subjects each. The non-psychotic unipolar depressed suicide attempters group was composed of 18 women and 2 men, with a mean age of 42.22 years old (*SD* = 15.12) and a mean of 9.53 (*SD* = 3.68) years of education, and the matching depressed non-attempters was composed of 13 women and 7 men, with a mean age of 44.28 years old (*SD* = 14.78) and a mean of 8.94 (*SD* = 3.54) years of education. Each past attempter had a mean of 3 suicidal acts. Fifteen subjects used medications to attempt suicide (75%) and 5 committed a more violent suicidal act (hanging, gas inhalation, etc.). The participants from this two experimental groups were recruited in the city of Faro (Portugal), more precisely from the Department of Psychiatry and Mental Health of Algarve Hospital (a state owned entity). With analogous characteristics, healthy controls comprised 13 women and 7 men, with a mean age of 43.25 years old (*SD* = 14.88) and a mean of 9.36 (*SD* = 3.61) years of education. All participants were Caucasians, Portuguese speakers and right-handers.

Exclusion criteria were current or prior history of bipolar disorders, schizophrenia, major psychosis, dementia, substance abuse, personality disorder, neurologic disease, including head injury involving a loss of consciousness, and suspected malingering.

This study was approved by the Algarve Hospital's Ethics Committee and was in conformity with the Helsinki declaration. After being provided with all the information about the study, all participants signed an informed consent.

2.2. Clinical assessment

Each participant completed a health and demographic questionnaire. Depression diagnoses were confirmed using the MINI International Neuropsychiatric Interview (MINI) (Sheehan et al., 1997) and the Portuguese adaptation of the Brief Symptom Inventory (BSI) (Canavarro, 2007). The depressive symptomatology at the time of the

assessment was evaluated using the 17-item Hamilton Depression Rating Scale (HAM-D-17 Itens) (Sousa et al., 1979). In order to screen for the presence of personality disorders, the PDQ-4 + Personality Diagnostic Questionnaire (Hyler, 1994) was applied. Current suicidal ideation was assessed using the Portuguese version of the Suicidal Ideation Questionnaire (SIQ) (Ferreira & Castela, 1999). Rey 15-Item Memory Test (15-IMT) was employed to detect malingering (Simões et al., 2010).

2.3. Neuropsychological assessment

The following tests were used:

a) Executive functions

Go/No-go task (GNG) – response inhibition

GNG is one of the most useful measures to assess response inhibition, where a motor response must be either executed or inhibited (Bezdjian et al., 2009; Herd et al., 2006; Steele et al., 2006). We applied the "simple" paradigm in which No-go stimulus was always the same. Its design comprises two stimuli, a Go stimulus and a No-go stimulus. Participants were asked to, as rapidly as possible, press a button for "active" stimuli and avoid pressing it for "passive" stimuli. Response inhibition was measured by the capability to hold back a response to No-go stimuli (Dimoska-Di Marco et al., 2011; Simmonds et al., 2008). GNG features the use of pre Supplementary Motor Area (pre-SMA), essential to the selection of an appropriate response or the inhibition of an inappropriate one (Simmonds et al., 2008). The version used was the Portuguese version (Moniz, de Jesus, Gonçalves, Viseu, Pacheco, & Moreira, 2015) of the computerized GNG from the Psychology Experiment Building Language (PEBL) (Mueller, 2013), a free access battery (Mueller & Piper, 2014).

Iowa Gambling Task (IGT) – decision-making

The purpose of IGT is simulating real-life judgment alterations, allowing to assess the subject's emotions associated with decision-making. Participants were instructed to perform a series of 100 selections from a group of four decks of cards (A, B, C and D), each resulting in a fixed monetary reward and, occasionally, in monetary losses. Decks A and B yielded the greater fixed rewards, 100$ per choice, but would become eventually disadvantageous, once, in the long run, punishments would surpass rewards. On the contrary, decks C and D, despite yielding rewards of half that amount (50$), were more advantageous, because, ultimately, rewards would exceed punishments (Bechara et al., 1994). Subjects were informed beforehand that there were decks better than others and that cards were in a predefined order (not likely to be changed by the computer so they could not win the game). The version used was the Portuguese version (Moniz, de Jesus, Gonçalves, Pacheco, & Viseu, 2015) of the computerized IGT from PEBL (Mueller, 2013).

Tower of London task (TOL) – planning

Inspired by Tower of Hanoi, a classic problem-solving puzzle (Kaller et al., 2004; McKinlay & McLellan, 2011; Newman et al., 2009; Piper et al., 2012), TOL is a visuospatial planning task that recruits the dorsal prefrontal-parietal-striatal network (Kaller et al., 2004; McKinlay & McLellan, 2011; Newman et al., 2009). We used the Portuguese version (Moniz, de Jesus, Viseu, Gonçalves, Pacheco, & Baptista, 2015) of the computerized TOL from PEBL (Mueller, 2013), which does not differ from manual versions regarding level of difficulty (McKinlay & McLellan, 2011). Participants were given three disks of different colors and three pegs of distinct heights that could hold either one, two, or three disks. Disks were arranged in a certain manner, distributed by one or more pegs, and the task's purpose consisted in moving them from their initial position, one at a time and making few moves as possible from peg to peg, in order to match a goal configuration displayed at the top of the screen (Kaller et al., 2004; Piper et al., 2012).

Victoria Stroop Test (VST) – inhibitory control

Stroop test measures inhibitory control, connecting systematically select PFC subregions involved in response inhibition and cognitive control, among which ACC and DLPFC (Harrison et al., 2005; Langenecker et al., 2004; Moeller et al., 2014; Potenza et al., 2003; Wagner et al., 2012). Our study employed the Portuguese version (Moniz, de Jesus, Gonçalves, Viseu, Baptista, & Pacheco, 2015) of the computerized VST from PEBL (Mueller, 2013), which is a briefer and slightly different version of the traditional one. There are three tasks: Dot task (items consist of colored dots), Neutral Word task (items are common words graphed in color) and Color Word task (items represent color names, such as "red", but are graphed in a different color than that enunciated by the word itself, e.g., "red" written in blue ink). On every task, participants were instructed to scan, from left to right, all items across and name, as fast and precisely as possible, the color of each one of them (Troyer et al., 2006).

Wisconsin Card Sorting Test (WCST) – set-shifting

WCST is one of the most recurrently used neuropsychological measures to assess, besides set-shifting, a range of other EFs, such as cognitive flexibility, abstract reasoning skills and planning. Participants were expected to place cards in one of four piles according to the characteristics of the stimuli. Rules to sort stimuli accurately change regularly. The ability to shift from one strategy to another according to the shape, color, or number of stimuli was recorded to allow the detection of perseverative errors (set-shifting), that is, further responses in which that rule might be inaccurately employed (Piper et al., 2012; Wagner et al., 2012). The applied version was the Portuguese version (Moniz, de Jesus, Viseu, Gonçalves, Moreira, & Pacheco, 2015) of the computerized WCST from PEBL (Mueller, 2013).

Trail Making Test (TMT) – trial B – visual attention and task switching

TMT comprises two parts – trials A and B. Trial B assesses working memory and EFs, such as the capability to switch between sets of stimuli (Cavaco et al., 2008a, 2013b). On trial B, participants were given two sets of 25 dots, one corresponding to numbers (1–

13) and the other to letters (A–L), and were instructed to connect dots, as fast as possible, in a sequential order. The sequence begins with the first number, proceeding to the first letter alphabetically, then the second number, and so forth (e.g., 1–A–2–B–3). We used the Portuguese version (Cavaco et al., 2013b).

b) Memory

Verbal Fluency Test (VFT) – verbal functioning

Besides EFs, VFT measures non-motor processing speed and language production, which recruit PFC and temporal lobes (Cavaco et al., 2013a). It consists of two tasks, namely semantic and phonemic fluency. Subjects were asked to give in 60 seconds the most names of animals and, in another three times 60 seconds, as many as possible words beginning with M, R and P letter's. We used the Portuguese version (Cavaco et al., 2013a).

Auditory Verbal Learning Test (AVLT) – declarative memory function

Considered a measure sensitive to verbal memory deficits and neurological impairment, AVLT evaluates episodic declarative memory and verbal learning (Cavaco et al., 2008b). It is composed of five consecutive trials, and after a 30-minute break, participants were expected to recall from a wider list the words that comprised the original one. We used the Portuguese version (Cavaco et al., 2008b).

c) Processing speed

Trail Making Test (TMT) – trial A –speed of eye-hand coordination

In addition to motor speed and coordination, trial A of TMT assesses attention, visual scanning and information processing (Cavaco et al., 2008a, 2013b). Participants

were given two sets of dots targeting numbers and were expected to connect them in a sequential order (e.g., 1–2–3).

Finger Tapping Task (FTT) – self-directed manual motor speed and control

FTT assesses fine motor speed and motor control and is widely considered as one of the most efficient measures for determining brain impairment (Mitrushina et al., 2005). The Portuguese version (Moniz, de Jesus, Pacheco, Gonçalves, & Viseu, 2015) of computerized FTT from PEBL (Mueller, 2013) was used, with the left and right index fingers: five consecutive trials in each hand, with a 10-second rest break following each trial, and a 30-second rest break every five trials. The mean of taps was averaged over five trials for each hand.

For computerized tests, a computer running Microsoft Windows 8.1 and either a touch screen (IGT, TOL, WCST), a keyboard (VST) or an external keypad (FTT and GNG) were used.

3. Results

3.1. Group characteristics

Demographic

A one-way analysis of variance (*ANOVA*) showed that depressed groups (attempters and non-attempters) and healthy controls did not differ significantly regarding age ($F(2,57) = .738$, $p = .483$, $\eta_p^2 = .025$), gender ($\chi^2 = 4.261$, $df = 2$, $p = .119$) and education ($F(2,57) = 1.658$, $p = .200$, $\eta_p^2 = .055$) (Table 1).

Table 1

Clinical parameters

T-tests demonstrated no significant differences between depressed groups with respect to depressive symptoms (BSI-D ($t = -.512$, $df = 38$, $p = .611$, $d = -.172$), HAM-D-17 ($t = -1.348$, $df = 38$, $p = .186$, $d = -.431$)), current suicidal ideation (SIQ Total [$t = 1.611$, $df = 38$, $p = .115$, d = .509]) or suicidal intent (SIQ, item 18 [$t = .312$, $df = 38$, $p = .757$, $d = .099$]).

3.2. Neuropsychological performance

a) Executive functions

GNG

Attempters performed more poorly than both control groups on GNG. Differences between the three groups ($F(2,57) = 11.315$, $p = .000$, $\eta_p^2 = .284$) and no differences between depressed non-attempters and healthy controls ($t = 0$, $df = 38$, $p = 1$, $d = 0$) were verified.

IGT

Depressed patients were outperformed by healthy controls on IGT. Differences between the three groups ($F(2,49) = 5.906$, $p = .005$, $\eta_p^2 = .194$) and no differences between depressed groups were found ($t = -1.274$, $df = 32$, $p = .212$, $d = -.434$).

TOL

Only depressed non-attempters performed more poorly on TOL. Differences between the three groups ($F(2,55) = 3.839$, $p = .028$, $\eta_p^2 = .122$) and no differences between attempters and healthy controls ($t = .796$, $df = 37$, $p = .431$, $d = .253$) were identified. Regarding time of performance, differences between all groups were observed ($F(2,55) = 8.988$, $p = .000$, $\eta_p^2 = .246$).

VST

Depressed patients were outperformed by healthy controls on VST. Regarding errors, we observed differences between the three groups ($F(2,52) = 3.074$, $p = .055$, $\eta_p^2 = .106$), no differences between depressed groups ($t = -.053$, $df = 34$, $p = .958$, $d = -.017$) and differences between depressed groups and controls ($t = 2.502$, $df = 53$, $p = .015$, $d = .770$).

WCST

Patients were outperformed by healthy controls on WCST. With respect to perseverative errors, results showed differences between the three groups ($F(2,53) = 7.798$, $p = .001$, $\eta_p^2 = .227$) and no differences between depressed groups ($t = .254$, $df = 36$, $p = .801$, $d = .081$). Similarly, concerning the percentage of conceptual level responses, we verified differences between the three groups ($F(2,53) = 9.758$, $p = .000$, $\eta_p^2 = .269$) and no differences between depressed groups ($t = .703$, $df = 36$, $p = .487$, $d = .228$).

TMT – trial B

Depressed patients exhibited poorer performances on trial B of TMT compared to healthy controls. Results yielded differences between the three groups ($F(2,51) = 8.558$, $p = .001$, $\eta_p^2 = .255$) and no differences between depressed groups ($t = .449$, $df = 37$, $p = .273$, $d = .355$).

b) Memory

We did not assess healthy controls on VFT and AVLT. Instead, we used Cavaco and colleagues (2008, 2013a) reference results.

VFT

Depressed groups differed neither in semantic fluency (animals) (t = -.816, df = 36, p = .420, d = -.263) or in phonemic fluency (MRP) (t = -.109, df = 35, p = .914, d = -.035).

AVLT

No differences were found between patient groups in immediate recall ($t = -1.007$, $df = 37$, $p = .321$, $d = -.327$) delayed recall ($t = -1.603$, $df = 37$, $p = .117$, $d = -.514$) or memory retention ($t = -.504$, $df = 37$, $p = .617$, $d = -.160$).

c) Processing speed

TMT – trial A

Patients performed worse than healthy controls on trial A of TMT. Differences between groups ($F(2,51) = 9.171$, $p = .000$, $\eta_p^2 = .265$) and no differences between depressed groups ($t = .449$, $df = 38$, $p = .656$, $d = .142$) were found.

FTT

On FTT, patients were outperformed by healthy controls. Differences were verified between groups regarding dominant hand ($F(2,55) = 8.165$, $p = .001$, $\eta_p^2 = .229$) and non-dominant hand ($F(2,55) = 4.301$, $p = .018$, $\eta_p^2 = .135$). No differences were found between depressed groups concerning dominant hand ($t = -.190$, $df = 36$, $p = .850$, $d = -.060$) and non-dominant one ($t = -.224$, $df = 36$, $p = .824$, $d = -.632$).

Figure 1

4. Discussion

In accordance to King and colleagues (2000) study – challenging the largely discussed theory that depressed suicidal individuals are usually characterized by deficits in EFs – but contrarily to most reports (Jollant et al., 2011; Keilp et al., 2001, 2008, 2012a; Marzuk et al., 2005; Richard-Devantoy et al., 2012a; 2012b, 2014; Westheide et al., 2008), some results of our study are most atypical. In spite of verifying that both groups of depressed patients got outperformed by healthy controls on most tests assessing EFs– as reported by previous studies (Austin et al., 2001; Beats et al., 1996; Biginger et al., 2005; Braaten et al., 2006; Cella et al., 2010; Gohier et al., 2009; Jollant et al., 2011; Keilp et al., 2001, 2008, 2012a; Kertzman et al., 2010; King et al., 2000; Lee et al., 2012; Marzuk et al., 2005; McDermott & Ebmeier, 2009; Richard-Devantoy et al., 2012a; 2012b, 2014; Rogers et al., 2004; Roiser et al., 2009; Stordal et al., 2004; Wagner et al., 2012; Westheide et al., 2008) and confirming our first hypothesis (all depressed subjects would perform more poorly compared to non-patients). Surprisingly, we did not find differences between non-psychotic unipolar depressed past suicide attempters and matching depressed non-attempters on the great majority of measures, disconfirming our second hypothesis. As in Westheide and colleagues (2008) study (which has employed the "complex" paradigm of GNG), depressed attempters performed poorly than depressed non-attempters and healthy controls on GNG, suggesting the presence of an impairment in response inhibition. However, in contrast to depressed non-attempters, depressed attempters' performance on TOL did not differ from that of healthy controls, which could indicate that their planning ability was relatively intact at the time of the assessment. However, we cannot consider these results isolatedly, mainly because, referring to a broad array of other related EFs (that comprise all heterogeneous cognitive processes necessary in the regulation of cognitive activity), results on other neuropsychological measures must be also taken into account.

Cognitive inhibition is, of all EFs, one of the most important core features of suicidal behavior, given that it is responsible for the processes of restriction of access to relevant information, deletion of no longer relevant information, and limitation of production of strong but possibly incorrect recover of information from working memory (Gohier et al., 2009; Richard-Devantoy et al., 2012a, 2012b). Cognitive inhibition

represents therefore an essential mechanism to an adequate control of feelings, thoughts and actions (Richard-Devantoy et al., 2012b), so, the presence of impairments regarding these particular processes may explain suicidal individuals' tendency for rumination, allied to the severe difficulties in discarding from their minds unwanted thoughts and ultimately to the entertainment of suicidal ideas, which is what underlies a suicidal crisis and triggers an attempt in the first place. Two of the forms of cognitive inhibition correspond to response inhibition, measured by GNG, and interference control, usually measured by the Stroop task. Whereas our sample of depressed attempters revealed to be impaired regarding the first, the same did not apply to the latter, signifying that their deficits with respect to inhibitory control cannot be considered worse than those shown by depressed non-attempters. This circumstance prevents us from the generalization that depressed past suicide attempters can be distinguished by a deficit in cognitive inhibition. Yet, it contributes to reignite the question, previously discussed by Marzuk and colleagues (2005) and Westheide and colleagues (2008), if suicidal ideation alone lies behind aggravated impairments in EFs, usually attributed to individuals who have already performed at least one suicide attempt regardless of current ideation. Once our clinical sample did not show significant differences concerning current suicidal ideation or suicidal intent, we have reasons to believe that the role played by suicidal ideation is a key factor for executive dysfunctions among depressed patients, past attempters or not.

Similarly, besides deficits in response inhibition, our results did not provide sufficient evidence of the presence of a cognitively rigid profile that could possibly allow differentiating clearly between depressed attempters and depressed non-attempters, once our suicidal group did not perform more poorly than depressed patients who had never attempted suicide on measures such as WCST, TOL or IGT, widely recognized to provide important evaluations regarding mental flexibility, planning, problem-solving and decision-making, among other features characteristic of such a profile. One the contrary, attempters' planning ability, measured by TOL, was superior than that of depressed non-attempters and yielded no differences compared to healthy controls. Thus, our results did not permit us to confirm our last hypothesis.

5. Limitations

Our study needs replication with larger samples.

Antidepressant treatment tend to improve performance on some measures, but, for ethical reasons, we could not assess the clinical sample off medications.

6. Conclusions

As far as the results of the current study are concerned, depressed attempters cannot be clearly distinguished by a deficit in cognitive inhibition, because they exhibited impairment in response inhibition but not in inhibitory control compared to depressed non-attempters. Our results, like King and colleagues (2000), challenge the presence of a cognitive rigidity among suicidal subjects, given that their performances did not indicate the presence of weaker abilities of planning, problem-solving and decision-making compared to depressed non-attempters, which are often attributed to mental inflexibility. On the other hand, we cannot ignore the presence of an impairment in response inhibition, and consequent dysfunction in pre Supplementary Motor Area (pre-SMA), essential to the selection of an adequate behavior, needed to select an appropriate response or to inhibit an inappropriate one (Simmonds et al., 2008).

In any case, the influence of cognitive inhibition in cognitive functioning of depressed suicide attempters must be further investigated in order to improve understanding of the potential impairments allied to suicidal behavior.

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Table 1. Descriptive Statistics (*N* = 60)

	Depressed non-attempters [a]	Depressed suicide attempters [b]	Healthy controls [c]	*p*-value	post hoc Tukey
	M (SD)	*M (SD)*	*M (SD)*		
Age	44.28 (14.78)	42.22 (15.12)	43,25 (14,88)	.483	---
Education	8.94 (3.54)	9.53 (3.68)	9,36 (3,61)	.200	---
BSI-D	2.26 (.98)	2.44 (1.18)	---	.611	---
HAM-D-17	17.20 (7.33)	20.42 (7.59)	---	.186	---
SF-Animals	14.0 (3.44)	14.94 (3.68)	---	.420	---
PF- (M, R, P)	21.50 (8.0)	21.76 (6.55)	---	.914	---
AVLT-IR	46.1 (9.0)	50.63 (8.53)	---	.321	---
AVLT-DR	9.8 (2.28)	10.57 (2.54)	---	.117	---
AVLT-R	85.42 (10.0)	87.44 (14.64)	---	.617	---
TMT-A	57.03 (15.9)	54.61 (18.03)	34.07 (14.74)	.000	C < U, S
TMT-B	154.45 (54.16)	131.71 (72.48)	72.92 (32.49)	.001	C < U, S
FT-D	53.15 (7.88)	53.66 (8.71)	62.45 (7.63)	.001	C > U, S
FT-ND	46,15 (7.29)	46.72 (8.44)	52.40 (6.45)	.018	C > U
TOL-extra	22.52 (8.59)	17.78 (6.77)	16.0 (7.24)	.028	**U > S, C**
TOL-time	456.7 (204.4)	366.5 (117.4)	267.7 (63.96)	.000	C < U
IGT-netscore	8.31 (23.23)	17.22 (17.41)	33.22 (23.57)	.005	C > U
WCST-CAT	24.26 (23.76)	27.10 (22.31)	14.55 (5.26)	.127	---
WCST-PE	19.89 (10.85)	19.0 (10.89)	8.61 (6.15)	.001	C < U, S
WCST-CLR	59.03 (16.37)	54.65 (21.68)	78.05 (11.17)	.000	C > U, S
VST-errors	3.41 (3.46)	3.47 (3.53)	1.31 (1.82)	.055	---
GNG-CE	6.0 (4.0)	11.95 (6.15)	6.0 (2.93)	.000	**S > U, C**
GNG-OE	.90 (1.48)	.55 (.88)	.15 (.36)	.075	---

Note. [a] n= 20, [b] n= 20, [c] n= 20; BSI-D: Depression scale from Brief Symptom Inventory; HAM-D-17: Hamilton Depression Rating Scale 17 itens; FT-D: Dominant hand from Finger Tapping Task; FT-ND: Non-Dominant hand from FTT; SF-Animals: Semantic Fluency (Animals); PF-(MRP): Phonemic Fluency (MRP); AVLT-IR: Immediate Recall from Auditory Verbal Learning Test; AVLT-DR: Delayed Recall (30') from AVLT; AVLT-R: Memory Recognition from AVLT; TMT-A: part A from Trail Making Test; TMT-B: part B from TMT; Tol-extra: extra moves from PEBL Tower of London; Tol-time: time from PEBL TL; IOWA-netscore: Net Score from PEBL Bechara (Iowa) Gambling Task; WCST-CAT: moves to complete 1st category from PEBL Wisconsin (Berg) Card Sorting Test; WCST-PE: Preservative errors from PEBL WCST; WCST-CLR: Conceptual level responses from PEBL WCST; Stroop-Interf.: Interference errors from PEBL Victoria Stroop Task; Go/NoGo-CE: Commission Errors from PEBL Go/NoGo Task; Go/NoGo-OE: Omission Errors from PEBL Go/NoGo Task

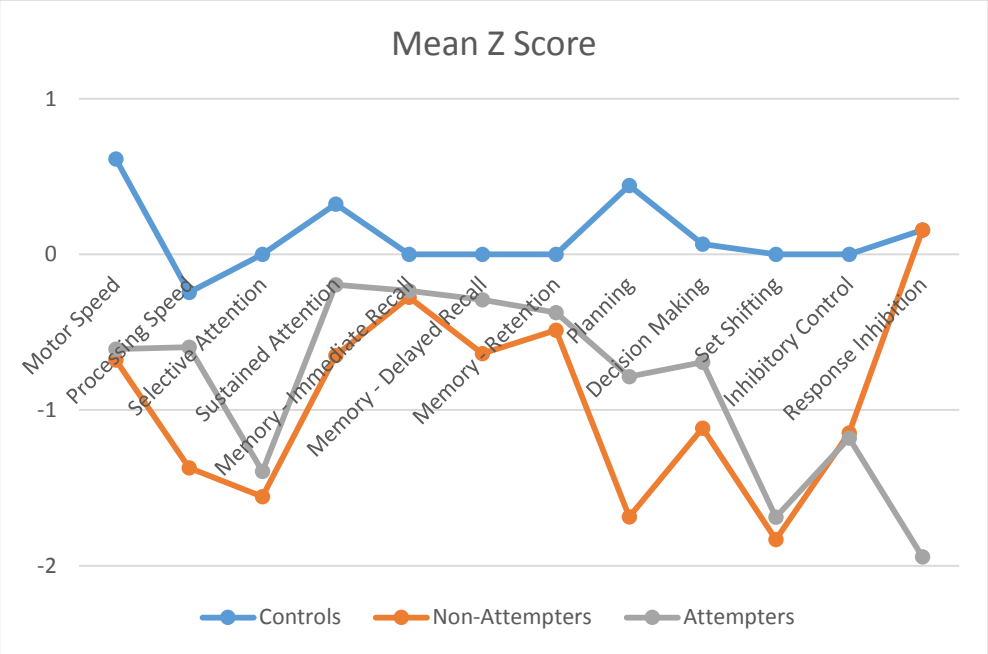

Figure 1. Z Scores of the Neuropsychological Tests Presented by Each Cognitive Domain

Conclusões

Apesar de a depressão representar uma perturbação psicopatológica que regista uma prevalência considerável, o conhecimento que se tem desta doença, mesmo considerando os números crescentes de novos estudos, traduz-se parco diante das questões ainda por esclarecer. Efetivamente, a mente humana reveste-se de uma complexidade assinalável, sendo cada pessoa um ser diferente, nunca independente da sua herança genética, assim como de um legado de conhecimentos e experiências que vai acumulando ao longo da vida, tão-pouco o é, do contexto sociológico de pertença e, de uma forma mais abrangente, da educação e da cultura.

Desta forma, não se espera que uma doença mental, como a depressão, se manifeste de forma homogénea; esperam-se, antes, nuances difíceis de categorizar. Um dos aspetos mais sensíveis associados ao episódio depressivo relaciona-se com o suicídio, que encontra na depressão um dos seus principais facilitadores, sendo este atualmente elevado a um problema de saúde pública e a segunda maior causa de morte entre os estratos mais jovens da população. Porém, nem todos os casos de depressão reclamam causas externas, assim como, nem todas as pessoas que atravessam situações adversas veem a sofrer de depressão.

Do mesmo modo, nem todos os sujeitos depressivos consideram o suicídio, tão pouco o atentam. Assim, independentemente das dificuldades inerentes, a depressão e os comportamentos suicidas entre pacientes deprimidos corresponde a um campo de estudo em manifesta expansão, reunindo esforços no sentido de desvendar, por exemplo, outras causas que não as externas, capazes de ajudar a explicar estes fenómenos, através da descoberta de marcadores que possam identificar e distinguir os casos de maior risco, com vista a investir numa resposta otimizada. Estudos em neuropsicologia e neurofisiologia têm convergido para que, até hoje, se achassem evidências, as quais, embora nem sempre consistentes, fornecem um vislumbre dos processos mentais presentes numa crise suicida. A pesquisa bibliográfica realizada na prossecução desta tese permitiu elencar e problematizar alguns desses dados, que atualmente se revestem de uma importância acrescida se o objetivo passa pelo controlo da depressão e pela prevenção do suicídio.

Tornou-se possível verificar que a investigação foi capaz de identificar as áreas cerebrais mais envolvidas nos comportamentos suicidas e que estas coincidem precisamente com as responsáveis pelo desempenho das funções executivas, pelo funcionamento da memória e pela velocidade de processamento. Combinando evidências neuroimagiológicas e neurocognitivas, hoje é possível reconhecer défices que diferenciam claramente o desempenho de sujeitos depressivos relativamente a indivíduos sem esta patologia mental. Embora muitas questões permaneçam longe de uma resposta completamente fiável, caminha-se a passos largos para desvendar, por exemplo, até que ponto o humor depressivo (podendo incluir-se aqui pensamentos de morte e ideação suicida) é, em si próprio, responsável por défices de capacidade de planeamento, tomada de decisão, mudança de foco de atenção, resposta e controlo inibitórios. Nesta ordem de ideias, é seguro afirmar que os testes neuropsicológicos que aferem tais capacidades perfazem meios auxiliares de diagnóstico cuja utilidade não deve ser ignorada. Porém, o uso destes recursos não se encontra ainda suficientemente generalizado, entre outras razões, em virtude dos custos monetários associados, nem sempre disponíveis.

Com vista a difundir esta prática em Portugal, o principal contributo desta tese passou por validar um conjunto de testes neuropsicológicos, retirado de uma bateria gratuita de acesso livre, junto da população portuguesa, controlando as variáveis idade, género e educação, e apresentando dados de referência para que, futuramente, possam ser utilizados por clínicos na sua prática clínica, bem como, por investigadores em estudos similares.

Outro objetivo passou por, através destes testes, corroborar as evidências cognitivas presentes na literatura. Ao longo de todos os estudos relatados nos artigos que fazem parte desta tese, foi possível confirmar a existência de défices executivos em pacientes depressivos em comparação com indivíduos saudáveis. Efetivamente, os sujeitos deprimidos apresentaram desempenhos mais fracos em todos os testes relativos aos vários domínios avaliados: velocidade psicomotora, capacidade de mudar o foco de atenção, capacidade de planeamento, capacidade de decisão, controlo inibitório e resposta inibitória. No que respeita aos pacientes deprimidos suicidas, os resultados não foram, contudo, os esperados. Com base na literatura, levantámos as hipóteses de que estes sujeitos exibiriam maiores défices do que sujeitos deprimidos não suicidas e de que o desempenho daqueles mostraria mais evidência do que o destes da presença de rigidez cognitiva. Surpreendentemente, mas em consonância com outros estudos, os nossos

resultados foram atípicos, não confirmando nenhuma das hipóteses. Este estudo veio assim contribuir para reforçar a ideia de que, apesar dos enormes avanços nesse sentido, ainda subsistem questões por explicar – um caminho extenso a trilhar com vista a alcançar um conhecimento mais profundo acerca do envolvimento do funcionamento cognitivo na depressão, particularmente em contextos de comportamentos suicidas.

Um dos resultados a reter neste estudo passa pela clara alteração da inibição de resposta em sujeitos suicidas, tendo os sujeitos depressivos não suicidas e controlo pontuado em média de forma idêntica. Tratou-se do primeiro estudo mundial em que foi utilizado o paradigma Go/Nogo "simples", em detrimento do paradigma "complexo", este último contaminado por processos associados à memória de trabalho, dependente do córtex pré-frontal dorsolateral (DLPFC). Sugere-se assim, em estudos futuros, a utilização de paradigmas Go/Nogo simples, dependente em exclusivo da área pré motora suplementar (pre-SMA).

Ficou ainda evidente, ao longo dos vários estudos que compõem esta tese, a necessidade em controlar a seleção da amostra com sujeitos depressivos, e que, embora saibamos que essa rigidez nos procedimentos leva a uma diminuição do número de sujeitos, o conhecimento científico sai favorecido pois as amostras perdem a contaminação de outras patologias afetivas, tais como, depressão bipolar.

Enquanto sugestões de investigação futura, considera-se de grande pertinência a replicação de todos os testes utilizados nos estudos aqui compilados, mas com amostras de maior dimensão e mais homogéneas no tocante aos grupos etários.

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ANEXOS

ANEXO A

Parecer da Comissão de Ética do Centro Hospitalar do Algarve

HOSPITAL DE FARO | CFIC Unidade de Investigação

UNIDADE DE INVESTIGAÇÃO
CENTRO DE FORMAÇÃO INVESTIGAÇÃO E CONHECIMENTO

INFORMAÇÃO

De: Miriam Vieira – Unidade de Investigação

Data: 09/04/2013

PARA: Ex.mo Sr.

Dr Marco Moniz

Serviço de Psicologia - DPSM

ASSUNTO: Pedido de Autorização para Estudo de Investigação "Défices Neuropsicológicos em Pacientes com Depressão, Ideação Suicida e História Anterior de Tentativas de Suicídio"

No seguimento da recepção do pedido de autorização para o projecto mencionado em epígrafe, somos de informar V/Exas que recaiu despacho de **"Autorizado"**, conforme documentos em anexo.

Mais se informa, que no final deverá ser enviado ao cuidado da Unidade de Investigação do Hospital de Faro, EPE, um exemplar dos resultados do estudo.

Qualquer esclarecimento adicional, poderá contactar-nos pelo email: miriam@hdfaro.min-saude.pt, ou pelo telefone n.º 289. 891 147, extensão 11537.

Com os melhores cumprimentos,

A Unidade de Investigação do CFIC

Miriam Vieira

Anexos:
- Parecer dos Resp. Serviço, Comissão de Ética com autorização do CA.

HOSPITAL DE FARO E.P.E

Autorizado
03.04.2013

O CONSELHO DE ADMINISTRAÇÃO

Comissão de Ética
para a Saúde

Exmo Senhor
Director Clínico
do Hospital de Faro

PARECER

Assunto: Estudo de Investigação "Défices Neuropsicológicos em Pacientes com Depressão, Ideação e Historia Anterior de Tentativas de Suicídio".

Investigador: Marco Moniz

Em relação ao estudo referido em epigrafe, considera esta C.E.S. que o mesmo tem interesse clinico e científico, estando salvaguardados os interesses e direitos dos doentes.

Assim sendo pensamos que o mesmo deve ser autorizado, desde que respeitadas as condicionantes impostas pela Sr.ª Diretora do Departamento de Psiquiatria e Saúde Mental,

Sem outro assunto, enviamos os nossos cumprimentos.

Faro, 21 de Março de 2013

A Comissão de Ética para a Saúde do Hospital de Faro, EPE

HOSPITAL DE FARO E.P.E
COMISSÃO DE ÉTICA

Direção Clínica
Entrada n.º 711/2013

ANEXO B

Instrumentos utilizados

BSI

Instruções: A seguir encontra-se uma lista de problemas ou sintomas que por vezes as pessoas apresentam. Assinale, num dos espaços à direita de cada sintoma, aquele que melhor descreve o GRAU EM QUE CADA PROBLEMA O INCOMODOU DURANTE A ÚLTIMA SEMANA. Para cada problema ou sintoma marque apenas um espaço com uma cruz. Não deixe nenhuma pergunta por responder.	Nunca	Poucas vezes	Algumas vezes	Muitas vezes	Muitíssimas vezes
1. Nervosismo ou tensão interior	0	1	2	3	4
2. Desmaios ou tonturas	0	1	2	3	4
3. Ter a impressão que as outras pessoas podem controlar os seus pensamentos	0	1	2	3	4
4. Ter a ideia que os outros são culpados pela maioria dos seus problemas	0	1	2	3	4
5. Dificuldade em se lembrar de coisas passadas ou recentes	0	1	2	3	4
6. Aborrecer-se ou irritar-se facilmente	0	1	2	3	4
7. Dores sobre o coração ou no peito	0	1	2	3	4
8. Medo na rua ou praças públicas	0	1	2	3	4
9. Pensamentos de acabar com a vida	0	1	2	3	4
10. Sentir que não pode confiar na maioria das pessoas	0	1	2	3	4
11. Perder o apetite	0	1	2	3	4
12. Ter um medo súbito sem razão para isso	0	1	2	3	4
13. Ter impulsos que não se podem controlar	0	1	2	3	4
14. Sentir-se sozinho mesmo quando está com mais pessoas	0	1	2	3	4
15. Dificuldade em fazer qualquer trabalho	0	1	2	3	4
16. Sentir-se sozinho	0	1	2	3	4
17. Sentir-se triste	0	1	2	3	4
18. Não ter interesse por nada	0	1	2	3	4
19. Sentir-se atemorizado	0	1	2	3	4
20. Sentir-se facilmente ofendido nos seus sentimentos	0	1	2	3	4
21. Sentir que as outras pessoas não são amigas ou não gostam de si	0	1	2	3	4
22. Sentir-se inferior aos outros	0	1	2	3	4
23. Vontade de vomitar ou mal-estar do estômago	0	1	2	3	4
24. Impressão de que os outros o costumam observar ou falar de si	0	1	2	3	4
25. Dificuldade em adormecer	0	1	2	3	4

	Nunca	Poucas vezes	Algumas vezes	Muitas vezes	Muitíssimas vezes
26. Sentir necessidade de verificar várias vezes o que faz	0	1	2	3	4
27. Dificuldade em tomar decisões	0	1	2	3	4
28. Medo de viajar de autocarro, de comboio ou de metro	0	1	2	3	4
29. Sensação de que lhe falta o ar	0	1	2	3	4
30. Calafrios ou afrontamentos	0	1	2	3	4
31. Ter de evitar certas coisas, lugares ou actividades por lhe causarem medo	0	1	2	3	4
32. Sensação de vazio na cabeça	0	1	2	3	4
33. Sensação de anestesia (encortiçamento ou formigueiro) no corpo	0	1	2	3	4
34. Ter a ideia que deveria ser castigado pelos seus pecados	0	1	2	3	4
35. Sentir-se sem esperança perante o futuro	0	1	2	3	4
36. Ter dificuldade em se concentrar	0	1	2	3	4
37. Falta de forças em partes do corpo	0	1	2	3	4
38. Sentir-se em estado de tensão ou aflição	0	1	2	3	4
39. Pensamentos sobre a morte ou que vai morrer	0	1	2	3	4
40. Ter impulsos de bater, ofender ou ferir alguém	0	1	2	3	4
41. Ter vontade de destruir ou partir coisas	0	1	2	3	4
42. Sentir-se embaraçado junto de outras pessoas	0	1	2	3	4
43. Sentir-se mal no meio das multidões como lojas, cinemas ou assembleias	0	1	2	3	4
44. Grande dificuldade em sentir-se próximo de outra pessoa	0	1	2	3	4
45. Ter ataques de terror ou pânico	0	1	2	3	4
46. Entrar facilmente em discussão	0	1	2	3	4
47. Sentir-se nervoso quando tem que ficar sozinho	0	1	2	3	4
48. Sentir que as outras pessoas não dão o devido valor ao seu trabalho ou às suas capacidades	0	1	2	3	4
49. Sentir-se tão desassossegado que não consegue manter-se sentado quieto	0	1	2	3	4
50. Sentir que não tem valor	0	1	2	3	4
51. A impressão de que, se deixasse, as outras pessoas se aproveitariam de si	0	1	2	3	4
52. Ter sentimentos de culpa	0	1	2	3	4
53. Ter a impressão de que alguma coisa não regula bem na sua cabeça	0	1	2	3	4

HAM-D-17 itens – The Hamilton Rating Scale for Depression (Hamilton, 1960)

Instruções: Seleccionar para cada item, a pontuação que melhor defina as características do doente.

ETIQUETA

Avaliador: _____ Data: _____

1. Humor depressivo
(Tristeza, desesperança, desamparo, inutilidade)

0. Ausente
1. Ligeiro: Sentimentos relatados apenas se inquirido.
2. Moderado: Sentimentos relatados espontaneamente com palavras.
3. Grave: Comunica os sentimentos não com palavras, isto é, com a expressão facial, a postura, a voz e a tendência ao choro.
4. Extremo: Sentimentos deduzidos da comunicação verbal e não-verbal do paciente.

2. Sentimentos de culpa

0. Ausente
1. Ligeiro: Auto recriminação; sente que decepcionou os outros.
2. Moderado: Ideias de culpa ou ruminação sobre erros passados ou más acções.
3. Grave: A doença actual é um castigo.
4. Extremo: Ouve vozes de acusação ou denúncia e/ou tem alucinações visuais ameaçadoras.

3. Suicídio

0. Ausente
1. Ligeiro: Sente que a vida não vale a pena.
2. Moderado: Desejaria estar morto ou pensa na possibilidade de sua própria morte.
3. Grave: Ideias e gestos suicidas.
4. Extremo: Tentativa de suicídio (qualquer tentativa séria, marcar 4).

4. Insónia Inicial
(Se toma hipnóticos e não pode avaliar, pontue 1)

0. Ausente
1. Ocasional: Queixa-se de dificuldade ocasional para conciliar o sono, isto é, mais de meia hora.
2. Frequente: Queixa-se de dificuldade para conciliar o sono todas as noites.

5. Insónia Intermédia
(Se toma hipnóticos e não pode avaliar, pontue 1)

0. Ausente
1. Ocasional: O doente queixa-se de inquietude e perturbação durante a noite.
2. Frequente: Acorda à noite (qualquer saída da cama marcar 2, excepto p/ urinar).

6. Insónia Terminal
(Se toma hipnóticos e não pode avaliar, pontue 1)

0. Ausente
1. Ocasional: O doente queixa-se de inquietude e perturbação durante a noite.
2. Frequente: Acorda à noite (qualquer saída da cama marcar 2, excepto p/ urinar).

7. Trabalho e actividades

0. Ausente
1. Ligeiro: Pensamentos e sentimentos de incapacidade, fadiga ou fraqueza relacionada a actividades, trabalho ou passatempos.
2. Moderado: Perda de interesse por actividade, (passatempos ou trabalho), quer directamente relatada pelo paciente, quer indirectamente por desatenção, indecisão e vacilação (sente que precisa esforçar-se para o trabalho ou actividade).
3. Intenso: Diminuição do tempo gasto em actividades ou queda de produtividade. (No hospital, marcar 3 se o paciente não passar ao menos 3 horas por dia em actividades ocernas (trabalho hospitalar ou passatempo)).
4. Extremo: Parou de trabalhar devido à doença actual. (No hospital, marcar 4 se o paciente não se ocupar com outras actividades, além de pequenas tarefas do leito, ou incapaz de realizá-las sem ajuda).

8. Lentificação
(Lentidão de ideias e fala; dificuldade de concentração; actividade motora diminuída)

0. Ausente
1. Ligeira: Ligeira inibição durante a entrevista; ligeiro embotamento emocional; expressão facial inexpressiva.
2. Moderada: Evidente inibição durante a entrevista (voz monótona, demora na resposta às perguntas).
3. Intensa: Entrevista difícil e prolongada; lentificação de movimentos e na marcha.
4. Extrema: Estupor depressivo completo; entrevista impossível.

9. Agitação

0. Ausente
1. Ligeira: Mexe os pés, brinca com as mãos ou com os cabelos.
2. Moderada: Mexe-se durante a entrevista; agarra-se à cadeira; mexe as mãos; rói as unhas, as mãos.
3. Grave: Não consegue estar quieto durante a entrevista; levanta-se da cadeira.
4. Extrema: A entrevista decorre "a correr", com o doente de um lado para o outro, ou mudando a roupa, ou arrancando cabelos; o doente parece desconcertado e "desatado".

10. Ansiedade Psíquica
(Aqui incluem-se muitos sintomas, tais como: tensão, incapacidade para relaxar ou concentrar-se, irritabilidade, preocupações com trivialidades (que não são ruminações depressivas), fobias, crises de ansiedade, etc.)

0. Ausente
1. Ligeira: Tensão e irritabilidade subjectiva.
2. Moderada: Tensão objectiva, evidente; preocupação com trivialidades.
3. Intensa: Atitude apreensiva evidente na expressão e na linguagem.
4. Extrema: Crises de ansiedade observada; a ansiedade forma a maior parte do conteúdo da sua comunicação espontânea verbal ou não-verbal.

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HAM-D-17 itens – The Hamilton Rating Scale for Depression (Hamilton, 1960)

11. Ansiedade Somática

(Sinais fisiológicos concomitantes de ansiedade, tais como: gastrointestinais (boca seca, flatulência, indigestão, diarreia, cólicas); cardiovasculares (palpitações, dorsalgias, sufocos, dor ou mal-estar precordial); respiratórios (hiperventilação, suspiros, dificuldade em respirar); aumento da frequência urinária; sudoreses; tensão muscular, tremores; tinnitus, vertigens; visão turva, etc.)

0. Ausente
1. Ligeira: Um só sintoma ou um sintoma duvidoso, ou vários sintomas de um mesmo sistema.
2. Moderada: Vários sintomas de distintos sistemas.
3. Intensa: Múltiplos sintomas de vários sistemas simultaneamente.
4. Extrema: (Crises de ansiedade observada; a ansiedade forma a maior parte do conteúdo da sua comunicação espontânea verbal ou não-verbal).

12. Sintomas Somáticos Gastrointestinais

0. Ausente
1. Ligeiro: Perda de apetite, mas alimenta-se voluntariamente. Sensações de peso no abdómen.
2. Intenso: Dificuldade em comer se não insistirem. Solicita ou exige laxantivos ou medicações para os intestinos ou para sintomas digestivos.

13. Sintomas Somáticos Gerais

0. Ausente
1. Ligeiro: Fadiga, perda de energia, peso nos membros, nas costas ou na cabeça. Dores nas costas, cefaleia, mialgias.
2. Intenso: Fadiga e perda de energia a maior parte do tempo; qualquer sintoma somático bem definido ou expresso espontaneamente é pontuado com 2.

14. Sintomas Genitais

(Sintomas como: perda de libido, distúrbios menstruais. Apesar de difícil valorização, deve tentar-se sempre anotar as alterações associadas claramente com a doença.

0. Ausente ou informação não adequada ou sem informação (empregar o menos possível estas duas últimas).
1. Ligeiro: Decréscimo da libido; actividade sexual alterada (inconstante, pouco intensa).
2. Moderado: Perda completa do desejo sexual; impotência ou frigidez funcionais.

15. Hipocondria

(Valorizar o sintoma que aparece ou aumentado, associado à depressão)

0. Ausente
1. Ligeira: Alguma preocupação pelas funções corporais e por sintomas orgânicos.
2. Moderada: Muito preocupado e atento a sintomas orgânicos; pensa que tem uma doença orgânica.
3. Intensa: Forte convicção de que sofre de uma perturbação orgânica que, para o doente, justifica a sua situação actual (pode ceder temporariamente à argumentação lógica); pedidos constantes de ajuda, etc.
4. Extrema: Ideias delirantes hipocondríacas.

16. Consciência

0. Ausente: O doente reconhece que está deprimido e doente.
1. Ligeira: Reconhece a sua doença, mas atribui-a à má alimentação, ao clima, ao excesso de trabalho, a uma infecção viral, à necessidade de descanso, etc.
2. Intensa: Nega estar doente.

17. Perda de Peso

(Em avaliações sucessivas, subtrair à pontuação inicial 1 se ganha 500g/semana e 2 se ganha 1 Kg/semana)

0. Ausente
1. Ligeira: Provável perda de peso associada à doença actual; perda superior a 500g/semana ou 2,5Kg/ano (sem dieta).
2. Intensa: Perda de peso definida segundo o doente; perda superior a 1 kg/semana ou 4,5 kg/ano (sem dieta).

	Resultado	<9 Normal (eutimia)	10-12 Depressão Ligeira	13-17 Depressão Moderada	>18 Depressão Grave
TOTAL:					

Referências:

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Bragança, M. & Palha, A. (2011). Depression and Neurocognitive Performance in Portuguese Patients Infected with HIV. *AIDS Behavior*, 15, 1879–1887.

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Gabinete de Avaliação e Reabilitação do Hospital de Faro, E.P.E.

HOSPITAL DE FARO

GABINETE DE AVALIAÇÃO E REABILITAÇÃO COGNITIVA

Personality Diagnostic Questionnaire PDQ-4

(Hyler, 1994; traduzido por Baptista, 1994)

Este questionário tem como finalidade conseguir uma descrição de si como pessoa. Ao responder pense no seu modo habitual de sentir, de pensar ou de se comportar *durante os últimos anos*.

Por favor responda Verdadeiro ou Falso a cada item.

V (Verdadeiro), quer dizer que de um modo geral a frase é verdadeira para si.

F (Falso), quer dizer que de um modo geral a frase é falsa para si.

Mesmo que não esteja completamente seguro da resposta a dar, indique para todas as afirmações se as considera em relação a si Verdadeiras "V", ou Falsas "F".

Por exemplo, para a questão:

Costumo ser teimoso ..... V F

Se de facto considera que tem sido teimoso durante os últimos anos, deve responder Verdade fazendo um círculo em volta do V.

Se, por outro lado, considera que esta afirmação não é verdade para si, responda Falso fazendo um círculo em volta do F.

Neste questionário não existem respostas certas ou erradas.

Pode demorar o tempo que quiser em cada uma das perguntas, mas não deixe nenhuma por responder.

Durante os últimos anos

1. Evito trabalhar com pessoas que me possam criticar ..... V F
2. Não consigo tomar decisões sem o conselho de outras pessoas ..... V F
3. Frequentemente entretenho-me com pormenores perdendo de vista os aspectos globais ou realmente importantes ..... V F
4. Necessito de ser o centro das atenções ..... V F

Durante os últimos anos

5. Consegui realizar muito mais do que os outros pensam que eu consigo fazer ..... V F
6. Faço o máximo que posso para evitar que aqueles de quem gosto se afastem de mim ... V F
7. As outras pessoas queixam-se que não estou em dia com os meus afazeres profissionais ou com os meus compromissos ..... V F
8. Tenho tido várias vezes problemas com a lei (ou teria tido se tivesse sido apanhado) .... V F
9. Não é interessante para mim passar o meu tempo com a família ou com os meus amigos ..... V F
10. Recebo mensagens especiais das coisas que acontecem à minha volta ..... V F
11. Sei que as pessoas iriam aproveitar-se de mim ou tentar enganar-me se eu as deixasse V F
12. Por vezes fico perturbado ..... V F
13. Só faço amigos quando tenho a certeza que as pessoas gostam de mim ..... V F
14. Habitualmente ando deprimido ..... V F
15. Prefiro que as outras pessoas assumam as responsabilidades por mim ..... V F
16. Perco o meu tempo a tentar tornar as coisas demasiado perfeitas ..... V F
17. Sou sexualmente mais atraente do que a maioria das pessoas ..... V F
18. Frequentemente dou comigo a pensar como sou uma pessoa excepcional ou como no futuro irei ser uma pessoa excepcional ..... V F
19. Ou gosto muito ou odeio, sem conseguir ter uma posição de meio termo ..... V F
20. Entro em muitas brigas ..... V F
21. Sinto que os outros não me compreendem ou não me apreciam ..... V F
22. Prefiro fazer coisas sozinho do que com outras pessoas ..... V F
23. Tenho a capacidade de saber que algumas coisas vão suceder antes de na realidade acontecerem ..... V F
24. Frequentemente interrogo-me se as pessoas que conheço são na realidade de confiança ..... V F
25. Ocasionalmente falo de outras pessoas sem elas estarem presentes ..... V F
26. Sou inibido nas minhas relações íntimas porque tenho medo de poder ser ridicularizado V F
27. Tenho medo de perder o suporte das outras pessoas se discordar delas ..... V F
28. Sofro de baixa auto-estima ..... V F
29. Ponho o trabalho à frente da família, dos amigos ou do divertimento ..... V F
30. Mostro facilmente as minhas emoções ..... V F
31. Somente as pessoas especiais conseguem na realidade compreender-me ou apreciar-me ..... V F
32. Por vezes interrogo-me acerca de quem sou na realidade ..... V F
33. Tenho dificuldade em pagar as minhas despesas porque não permaneço muito tempo em cada um dos empregos em que tenho trabalhado ..... V F
34. O sexo não me interessa ..... V F

Durante os últimos anos

35. Os outros consideram-me de humores ou que "fervo em pouca água" ..... V F
36. Frequentemente consigo sentir ou pressentir coisas que os outros não conseguem ..... V F
37. Os outros utilizam o que eu digo contra mim ..... V F
38. Existem algumas pessoas de quem eu não gosto ..... V F
39. Sou mais sensível à crítica ou à rejeição do que a maioria das pessoas ..... V F
40. Tenho dificuldade em começar algo que tenha de fazer sozinho ..... V F
41. Tenho um sentimento de moralidade mais elevado que as outras pessoas ..... V F
42. Sou o meu maior crítico ..... V F
43. Utilizo a minha aparência ou atracção física para obter a atenção que necessito ..... V F
44. Necessito muito que as outras pessoas me elogiem ou reconheçam o meu valor ..... V F
45. Tentei suicidar-me ou fazer mal a mim próprio ..... V F
46. Faço muitas coisas sem tomar em consideração as consequências ..... V F
47. Existem poucas actividades em que tenha algum interesse ..... V F
48. As pessoas têm frequentemente dificuldade em compreender aquilo que eu digo ..... V F
49. Ponho objecções quando os meus supervisores me dizem como é que devo desempenhar as minhas tarefas ..... V F
50. Mantenho-me atento para compreender o significado real do que as pessoas dizem ..... V F
51. Nunca disse uma mentira ..... V F
52. Tenho medo de me encontrar com pessoas que não conheço porque me sinto acanhado ..... V F
53. Desejo tanto que as outras pessoas gostem de mim que me ofereço para fazer coisas que não gosto ..... V F
54. Acumulei muitas coisas que não preciso, mas que não consigo deitar fora ..... V F
55. Apesar de falar muito, as pessoas dizem que tenho dificuldade em explicar aquilo que quero ..... V F
56. Preocupo-me muito ..... V F
57. Espero que as outras pessoas me façam favores, apesar de eu habitualmente não os fazer aos outros ..... V F
58. Sou uma pessoa com grandes variações de humor ..... V F
59. Sou capaz de mentir com facilidade e frequentemente faço-o ..... V F
60. Não estou interessado em ter amigos íntimos ..... V F
61. Estou frequentemente atento, ou à defesa, para que os outros não se aproveitem de mim ..... V F
62. Nunca perdoei ou perdoo àqueles que me fazem mal ..... V F
63. Sinto ressentimento em relação às pessoas que têm mais "sorte" do que eu ..... V F
64. Pode ser que uma guerra nuclear não seja uma ideia tão má como isso ..... V F
65. Quando estou só sinto-me sem ajuda e incapaz de tomar conta de mim próprio ..... V F

III

Durante os últimos anos

66. Se os outros não conseguem fazer as coisas correctamente, prefiro ser eu a faze-las por mim próprio ..... V F
67. Tenho jeito para tudo o que é dramático ..... V F
68. Algumas pessoas pensam que eu me aproveito dos outros para meu próprio benefício .. V F
69. Sinto que a minha vida é aborrecida e sem significado ..... V F
70. Sou crítico dos outros ..... V F
71. Não me preocupo com o que os outros têm que dizer a meu respeito ..... V F
72. Tenho dificuldade em me relacionar com os outros em situações em que tenha que estar face a face ..... V F
73. As pessoas queixam-se frequentemente que eu não compreendo quando elas estão perturbadas ..... V F
74. As pessoas podem me achar bastante esquisito ou excêntrico pelo meu aspecto ..... V F
75. Gosto de fazer coisas arriscadas ..... V F
76. Menti frequentemente nas respostas que dei neste questionário ..... V F
77. Queixo-me muito das minhas dificuldades ..... V F
78. Tenho dificuldade em controlar a minha cólera ..... V F
79. Algumas pessoas têm inveja de mim ..... V F
80. Sou facilmente influenciado pelos outros ..... V F
81. Considero-me uma pessoa muito poupada, mas os outros acham-me forreta ..... V F
82. Quando uma relação íntima termina, necessito imediatamente de me envolver com outra pessoa ..... V F
83. Sofro de baixa auto estima ..... V F
84. Sou pessimista ..... V F
85. Respondo logo a quem me insulta ..... V F
86. Estar com outras pessoas põe-me nervoso ..... V F
87. Sinto-me embaraçado em situações novas ..... V F
88. Fico aterrorizado perante a ideia de ficar só a tomar conta de mim próprio ..... V F
89. As pessoas queixam-se que eu "sou teimoso como um burro" ..... V F
90. Levo mais a sério os meus relacionamentos do que as pessoas com quem me envolvo . V F
91. Posso ser desagradável com alguém e logo de seguida ser capaz de lhe pedir desculpa V F
92. Os outros consideram que eu sou vaidoso ..... V F
93. Quando estou sob stress as coisas acontecem. Como por exemplo, fico paranóide, ou simplesmente "expludo" ..... V F
94. Não me importo se magoo ou não os sentimentos dos outros desde que eu obtenha aquilo que quero ..... V F
95. Mantenho-me distante das outras pessoas ..... V F
96. Interrogo-me frequentemente se a minha mulher (marido, namorado ou namorada) me é infiel ..... V F

Durante os últimos anos

97. Tenho frequentemente sentimentos de culpa ..... V F

98. Fiz coisas sob o impulso do momento (como as descritas em baixo) que me podem trazer problemas

Assinale todas as que a si se aplicam

a. Gastar mais dinheiro do que tenho ..... V F
b. Ter relações sexuais com pessoas que mal conheço ..... V F
c. Beber em demasia ..... V F
d. Utilizar drogas ..... V F
e. Comer grandes quantidades ..... V F
f. Conduzir de modo louco ..... V F

99. Quando era novo (antes dos 15 anos) eu era como um delinquente juvenil, e fazia algumas das coisas descritas em baixo

Assinale todas as que a si se aplicam

1. Fui considerado um tirano ..... V F
2. Costumava iniciar brigas com os outros miúdos ..... V F
3. Utilizei armas nas brigas em que me envolvi ..... V F
4. Roubei ou assaltei outras pessoas ..... V F
5. Fui fisicamente cruel para outras pessoas ..... V F
6. Fui fisicamente cruel para os animais ..... V F
7. Forcei alguém para ter relações sexuais comigo ..... V F
8. Menti muito ..... V F
9. Saía de casa à noite sem permissão dos meus pais ..... V F
10. Roubei coisas a outras pessoas ..... V F
11. Peguei fogos ..... V F
12. Parti janelas ou destruí pertences de outras pessoas ..... V F
13. Fugi de casa, passando pelo menos uma noite fora, mais de uma vez ..... V F
14. Comecei a faltar bastante à escola antes de fazer 13 anos ..... V F
15. Entrei sem permissão na casa, apartamento ou carro de outra pessoa ..... V F

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Hyler, S. E. (1994). *Personality Diagnostic Questionnaire, 4th Ed. (PDQ-4)*. New York: New York State Psychiatric Institute.

QIS

Seguidamente encontra-se uma lista de 30 itens, peço-lhe para responder, assinalando com uma cruz (X), a resposta que melhor expressa o seu sentimento nos últimos 6 meses. Cada item tem 7 possibilidades de resposta.

Escala de resposta

1- Nunca
2- Quase Nunca
3- Raramente
4- Às vezes
5- Frequentemente
6- Quase Sempre
7- Sempre

		1	2	3	4	5	6	7
1	Pensei que seria melhor não estar vivo.							
2	Pensei suicidar-me.							
3	Pensei na maneira como me suicidaria.							
4	Pensei quando me suicidaria.							
5	Pensei em pessoas a morrerem.							
6	Pensei na morte.							
7	Pensei no que escrever num bilhete sobre o suicídio.							
8	Pensei em escrever um testamento.							
9	Pensei em dizer às pessoas que planeava suicidar-me.							
10	Pensei que as pessoas estariam mais felizes se eu não estivesse presente.							
11	Pensei em como as pessoas se sentiriam se me suicidasse.							
12	Desejei estar morto(a).							
13	Pensei em como seria fácil acabar com tudo.							
14	Pensei que suicidar-me resolveria os meus problemas.							
15	Pensei que os outros ficariam melhor se eu estivesse morto(a).							
16	Desejei ter coragem para me matar.							
17	Desejei nunca ter nascido.							
18	Pensei que se tivesse oportunidade me suicidaria.							
19	Pensei na maneira como as pessoas se suicidam.							
20	Pensei em matar-me, mas não o faria.							
21	Pensei em ter um acidente grave.							
22	Pensei que a vida não valia a pena.							
23	Pensei que a minha vida era muito miserável para continuar.							
24	Pensei que a única maneira de reparem em mim era matar-me.							
25	Pensei que se me matasse as pessoas se aperceberiam que teria valido a pena preocuparem-se comigo.							
26	Pensei que ninguém se importava se eu estivesse vivo(a) ou morto(a).							
27	Pensei em magoar-me mas não em suicidar-me							
28	Perguntei-me se teria coragem para me matar.							
29	Pensei que se as coisas não melhorassem eu matar-me-ia							
30	Desejei ter o direito de me matar.							

AVLT – Auditory Verbal Learning Test

Lista de palavras	Ensaios de Evocação Imediata					30'	Ensaio de Reconhecimento Diferido			
	1	2	3	4	5					
Livro							Cabeça	S N	Terra	S N
Flor							Espelho	S N	Pão	S N
Comboio							Comboio	S N	Flor	S N
Sapato							Carta	S N	Sapato	S N
Água							Janela	S N	Automóvel	S N
Espelho							Cor	S N	Edifício	S N
Cavalo							Faca	S N	Livro	S N
Mesa							Escala	S N	Plano	S N
Igreja							Montanha	S N	Cavalo	S N
Rádio							Dedo	S N	Água	S N
Bola							Lenço	S N	Unha	S N
Dedo							Bola	S N	Senhor	S N
Carta							Nuvem	S N	Rádio	S N
Faca							Sinal	S N	Mesa	S N
Terra							Igreja	S N	Professor	S N
TOTAL							∑ respostas erradas = falsos positivos + falsos negativos			
							TOTAL: (30 - ∑ respostas erradas)			

Instruções	
1	Eu vou ler uma longa lista de palavras. Por favor, escute atentamente. Quando acabar de ler, por favor, diga-me todas as palavras que conseguir dessa lista. Não precisa de ser por ordem.
2	Agora vou ler a mesma lista novamente, na verdade, eu vou lê-la várias vezes. Sempre que eu parar, diga-me todas as palavras que conseguir se lembrar, incluindo as que disse anteriormente.
3-5	Eu vou ler a lista outra vez. Por favor, escute atentamente.
30'	Lembra-se da lista de palavras que eu li algumas vezes? Diga-me, por favor, todas as palavras que conseguir dessa lista.
R	Eu vou ler uma outra lista de palavras. Esta nova lista de palavras inclui palavras da lista anterior, bem como, outras palavras que não estavam na lista anterior. Para cada uma das palavras, por favor, diga sim ou não, se essa palavra fazia ou não parte da lista anterior.

EI – evocação imediata (∑ dos ensaios 1 a 5)	
AP – aprendizagem (∑ dos ensaios 1 a 5) – (5*ensaio 1)	
IR – índice de retenção 100 * (ensaio 30' / ensaio 5)	

Teste de Fluência Verbal

Nome:			Nº de Proc.:
Sexo:	Data Nasc:	Idade:	Escolaridade:
Data e Local:			Examinador:

Fluência V. Categorial (Semântica)	
Animais	
1	21
2	22
3	23
4	24
5	25
6	26
7	27
8	28
9	29
10	30
11	31
12	32
13	33
14	34
15	35
16	36
17	37
18	38
19	39
20	40
Total (Corte ≤ 15):	

Fluência Verbal Literal (Fonémica)		
M	R	P
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15
16	16	16
17	17	17
18	18	18
19	19	19
20	20	20
Total (Corte ≤ 30):		

Instruções:

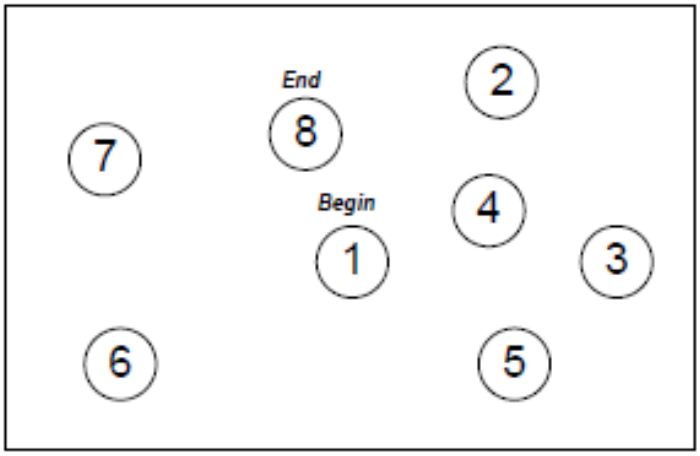
Vou-lhe pedir que me diga o maior número de animais que conseguir. Não deve repetir a mesma espécie animal com pequenas variações, como por exemplo "cão, cadela". Tem 1 minuto para me dizer o maior número de animais diferentes. Está pronto? Comece!

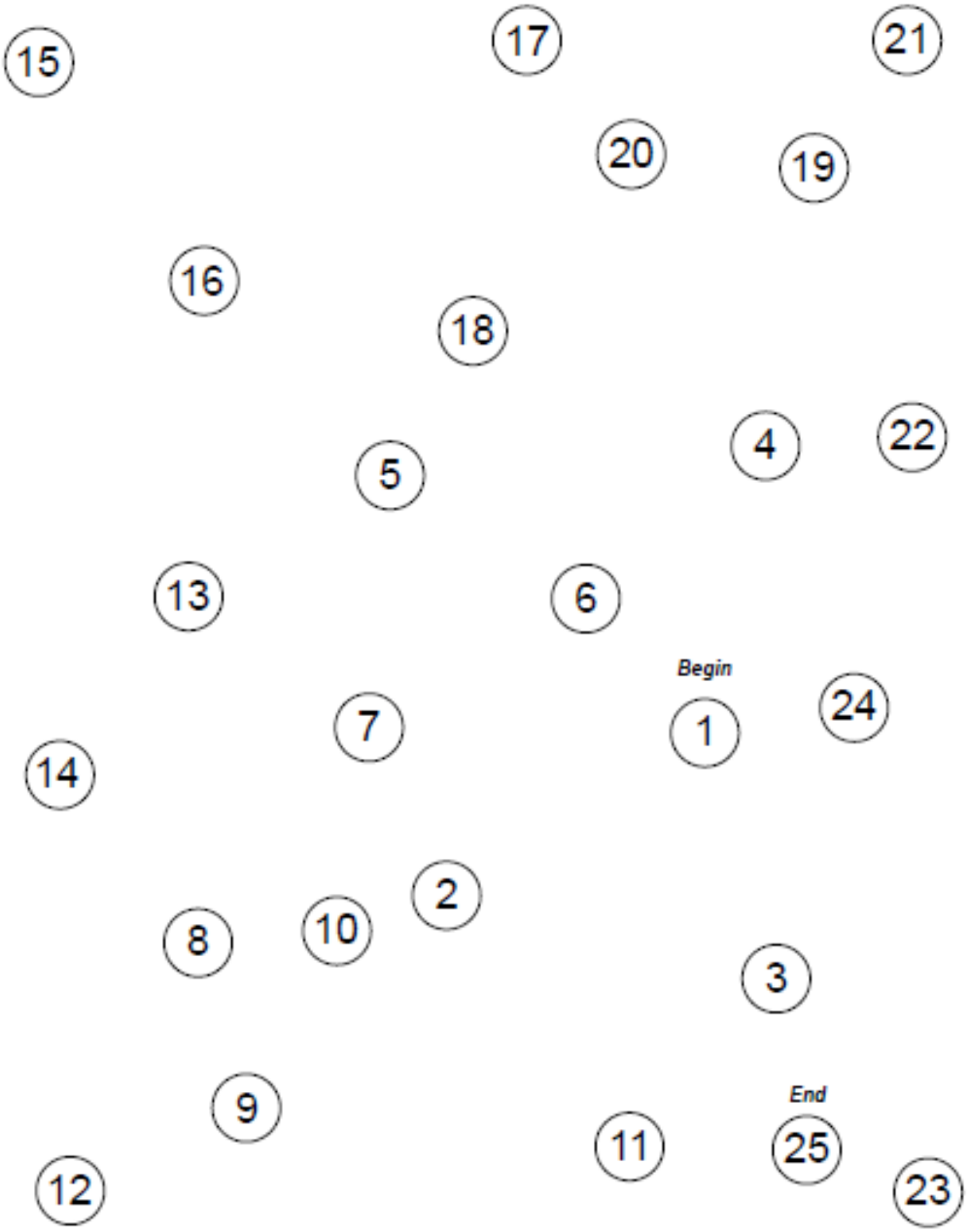
Vou-lhe dizer uma letra do alfabeto e terá um minuto para dizer todas as palavras de que se lembre que comecem com essa letra e o mais rápido que conseguir. Pode dizer todas as palavras excepto nomes próprios, ou seja, palavras que começam com letra maiúscula, tais como nomes de pessoas ou de lugares. Por ex. "Bernardo" ou "Bélgica". Também não pode usar a mesma palavra com outra terminação, por ex. se disser "transportar" não pode dizer a seguir "transportador". Está pronto, a primeira letra é o "M". Comece!

TRAIL MAKING

Part A

Sample




15
17
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Begin
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10
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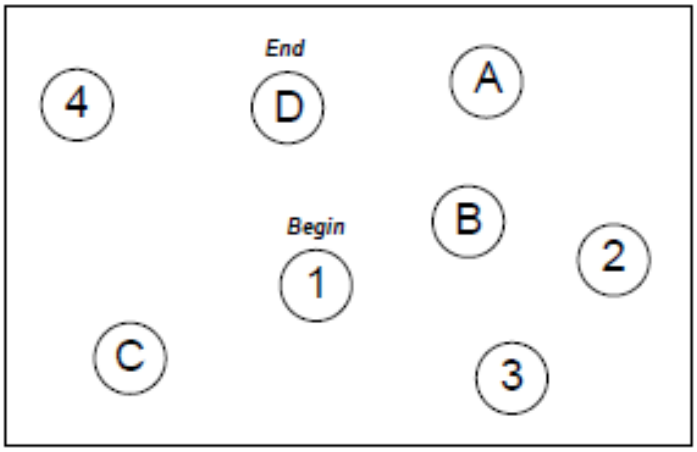
9
End
11
25
12
23

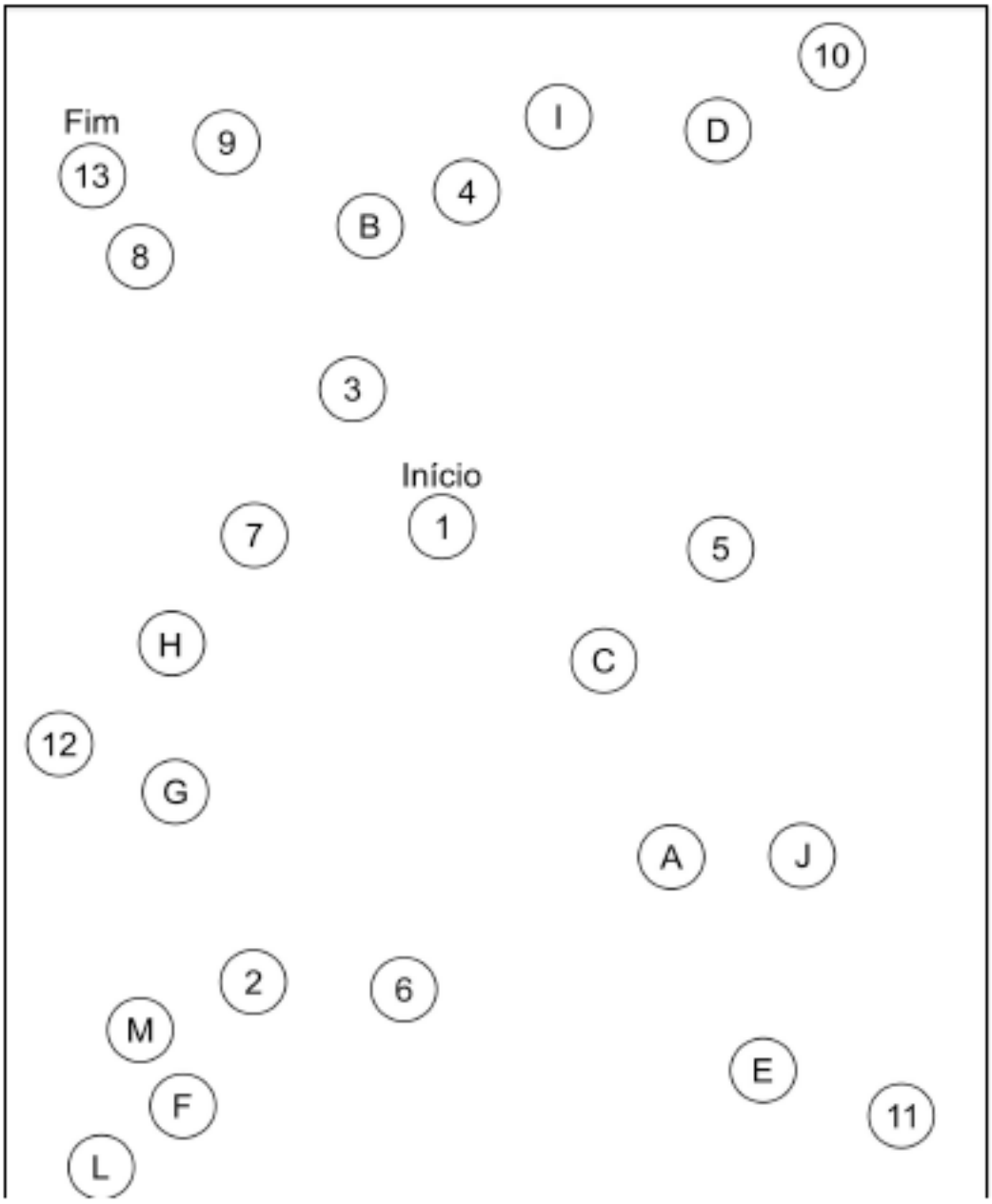
TRAIL MAKING

Part B

Sample

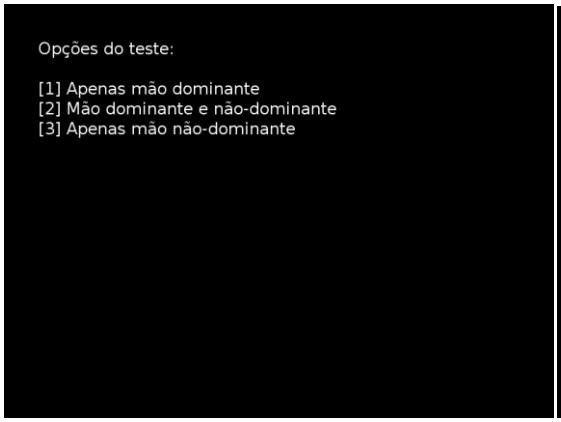


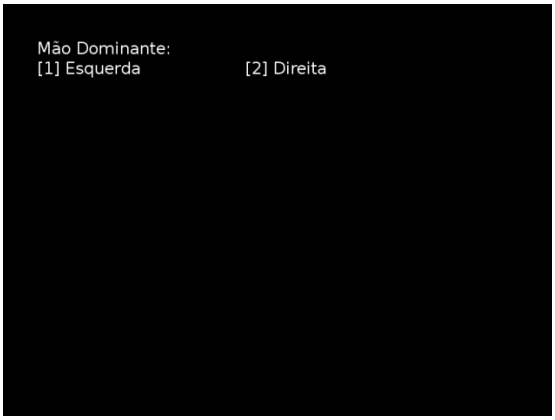
Trail Making Test (TMT)
Parte B

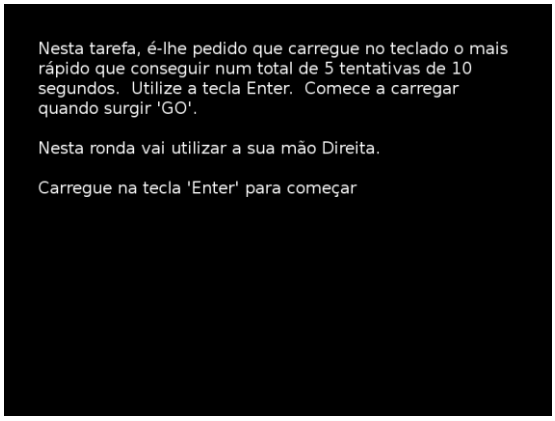


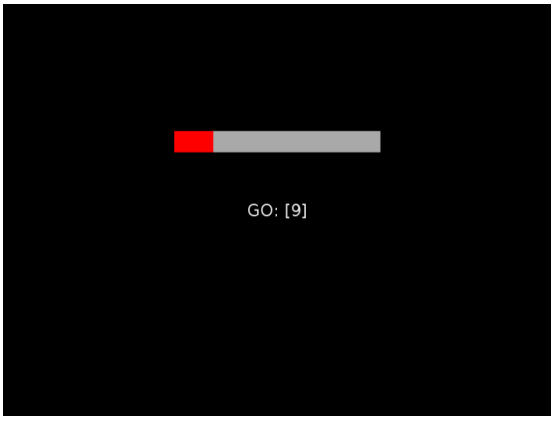
ANEXO C

Imagens Software Finger Tapping Task


Opções do teste:
[1] Apenas mão dominante
[2] Mão dominante e não-dominante
[3] Apenas mão não-dominante

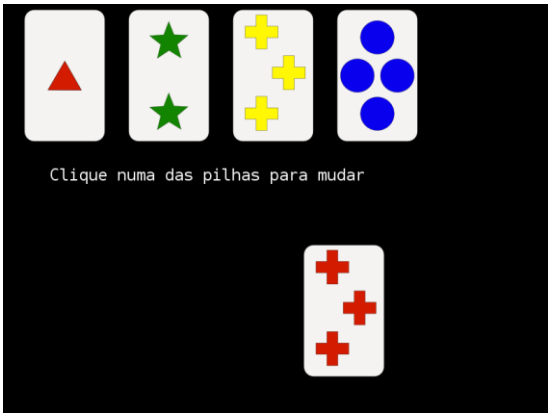

Mão Dominante:
[1] Esquerda
[2] Direita

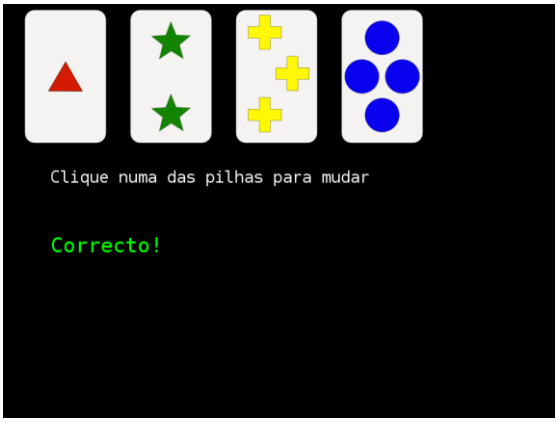

Nesta tarefa, é-lhe pedido que carregue no teclado o mais rápido que conseguir num total de 5 tentativas de 10 segundos. Utilize a tecla Enter. Comece a carregar quando surgir 'GO'.
Nesta ronda vai utilizar a sua mão Direita.
Carregue na tecla 'Enter' para começar

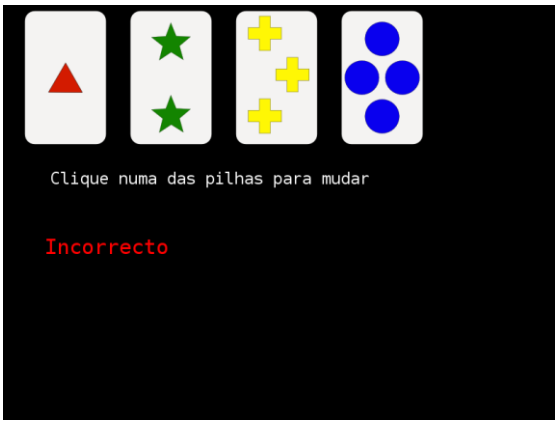

GO: [9]

ANEXO D

Imagens Software Wisconsin (Berg) Sorting Test

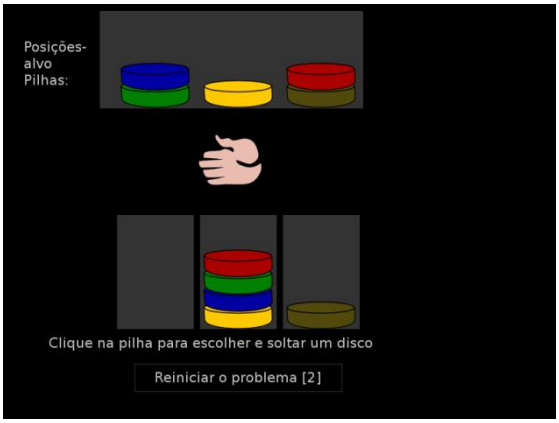

Clique numa das pilhas para mudar


Clique numa das pilhas para mudar
Correcto!


Clique numa das pilhas para mudar
Incorrecto

ANEXO E

Imagens Software Tower of London


Posições-alvo
Pilhas:
Clique na pilha para escolher e soltar um disco
Reiniciar o problema [2]

ANEXO F

Imagens Software Iowa Gambling Task

Seleccione o grupo clicando com o rato (dedo)

1 2 3 4

Total: $2000

ANEXO G

Imagens Software Victoria Stroop Test

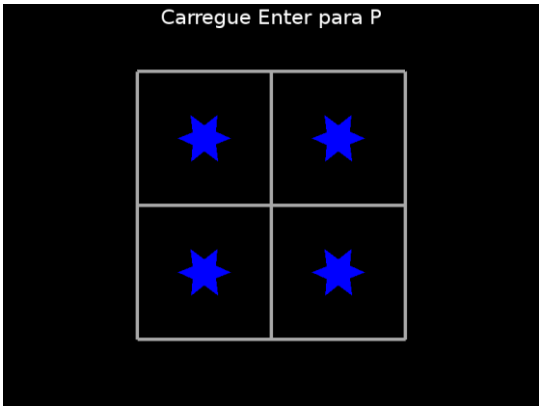

Pressione a tecla para indicar a côr.
[1] amarelo
[2] verde
[3] azul
[4] vermelho

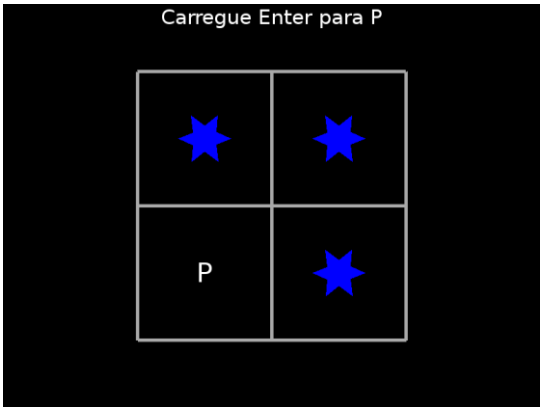

Pressione a tecla para indicar a côr.
tudo nunca cada hoje
nunca tudo hoje cada
tudo cada nunca hoje
nunca hoje tudo cada
tudo nunca cada hoje
cada tudo nunca hoje
[1] amarelo
[2] verde
[3] azul
[4] vermelho


Pressione a tecla para indicar a côr.
verde vermelho azul amarelo
vermelho verde azul amarelo
verde azul vermelho amarelo
azul verde amarelo vermelho
amarelo azul vermelho verde
azul vermelho verde amarelo
[1] vermelho
[2] azul
[3] verde
[4] amarelo

ANEXO H

Imagens Software Go/Nogo Task


Carregue Enter para P


Carregue Enter para P
P