A Fundação BIAL é uma instituição sem fins lucrativos, considerada de utilidade pública pelo Governo português, que tem como missão incentivar o conhecimento científico do Homem, tanto do ponto de vista físico como espiritual.

Constituída em 1994 pelos Laboratórios BIAL e pelo Conselho de Reitores das Universidades Portuguesas, tem os altos patrocínios do Senhor Presidente da República e da Ordem dos Médicos.

A atividade da Fundação BIAL desenvolve-se através da atribuição do Prémio BIAL, um dos maiores galardões na área da saúde em toda a Europa, e do lançamento de Bolsas de Investigação Científica na área das Neurociências.

Bianualmente, a Fundação BIAL organiza os simpósios Aquém e Além do Cérebro, um espaço de diálogo aberto que reúne alguns dos mais prestigiados especialistas mundiais nas áreas da Psicofisiologia e da Parapsicologia e os seus bolseiros.

Nestes encontros, através da exposição de posters e das sessões de comunicações orais de um conjunto de projetos, a Fundação BIAL apresenta à comunidade científica os resultados das investigações dos seus bolseiros.

O livro de atas que agora se publica é uma compilação dos textos das palestras apresentadas durante o 9º Simpósio da Fundação BIAL dedicado ao tema "Sono e Sonhos".

The BIAL Foundation is a non-profit-making institution, considered as a public utility by the Portuguese Government. Its main objective is to encourage the scientific study of Man, from both the physical and spiritual perspectives.

Established in 1994 by the Laboratórios BIAL and by the Council of Rectors of the Portuguese Universities, the BIAL Foundation includes among its patrons the President of Portugal and the Portuguese Medical Association.

The activity of the BIAL Foundation involves the BIAL Award, one of the most important awards in the field of health in Europe, and the Bial Fellowship Programme in the area of Neuroscience.

Every two years the BIAL Foundation organizes the "Behind and beyond the brain" symposium, – a discussion forum where dialogue is most encouraged – that brings together bursary-holders and several world-renowned experts in the fields of Psychophysiology and Parapsychology.

In these symposia, through posters session and oral communications of some of its supported projects, the BIAL Foundation presents to the scientific community the results of the scientific research developed by its Fellows.

The Proceedings that are now being published include the texts of the lectures presented during the 9th Symposium "Behind and Beyond the Brain" dedicated to the theme "Sleep and Dreams".

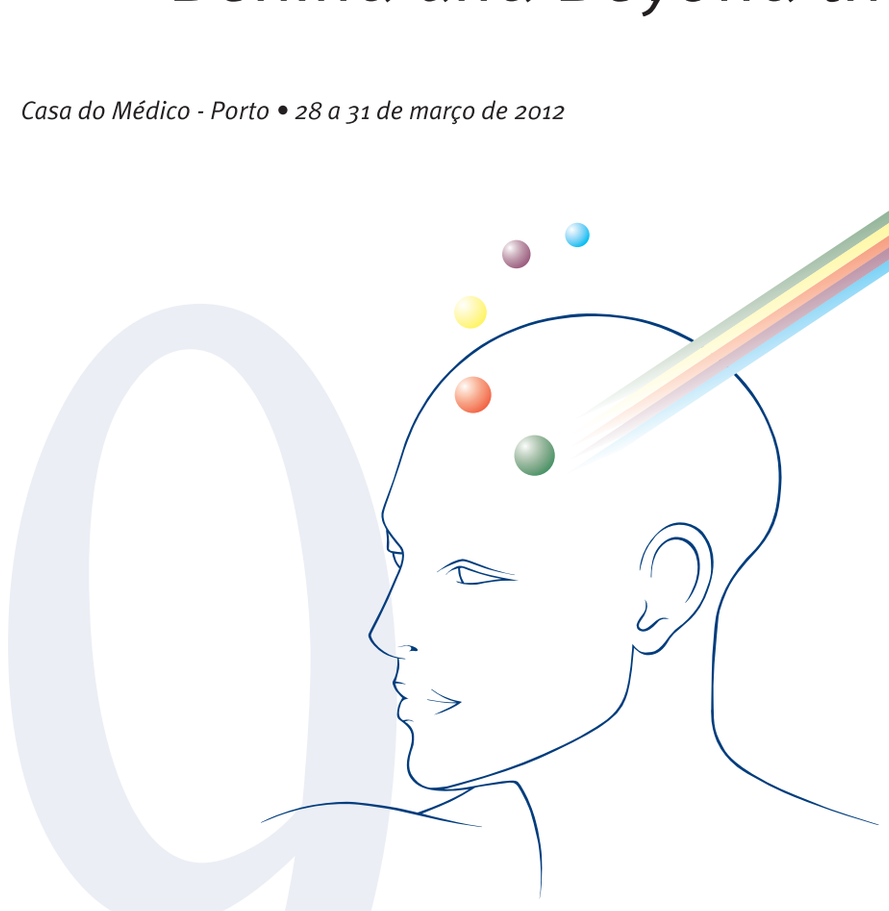
9º Simpósio da Fundação Bial

AQUÉM E ALÉM DO CÉREBRO
BEHIND AND BEYOND THE BRAIN

9º Simpósio da Fundação Bial

Aquém e Além do Cérebro
Behind and Beyond the Brain

Casa do Médico - Porto • 28 a 31 de março de 2012



FUNDAÇÃO Bial
Instituição de utilidade pública
Institution of public utility

Sono e sonhos

Sleep and dreams

O livro "Aquém e Além do Cérebro" contém as atas do 9º Simpósio da Fundação Bial, realizado na Casa do Médico, de 28 a 31 de março de 2012, tendo como membros da Comissão Organizadora os Senhores Professores Fernando Lopes da Silva, Dick Bierman, Miguel Castelo-Branco, Alexandre Castro-Caldas, Axel Cleeremans, Rui Mota Cardoso, Mário Simões e Caroline Watt.
Os textos estão disponíveis em www.bial.com.

The book "Behind and Beyond the Brain" includes the texts of the Bial Foundation's 9th Symposium, held at Casa do Médico, from the 28th to the 31st March 2012, having as members of its Organizing Committee the following Professors: Fernando Lopes da Silva, Dick Bierman, Miguel Castelo-Branco, Alexandre Castro-Caldas, Axel Cleeremans, Rui Mota Cardoso, Mário Simões and Caroline Watt.
The texts are available at www.bial.com.

Foi publicado em 1ª edição pela Fundação Bial com uma tiragem de 2.250 exemplares.

It was published as 1st edition by Fundação Bial with a print run of 2.250 copies.

Execução Gráfica / *Printed by*: Multitema
Depósito Legal Nº 353797/13
ISBN: 978-972-99286-4-2

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SESSÃO DE ABERTURA
OPENING SESSION

DISCURSO DO PRESIDENTE DA FUNDAÇÃO BIAL

Luís Portela

Bem-vindos ao 9º Simpósio Aquém e Além do Cérebro. Obrigado a todos por terem querido estar aqui hoje connosco. Um agradecimento especial à Senhora Secretária de Estado da Ciência, Prof. Leonor Parreira, por ter aceite presidir a esta cerimónia de abertura em representação do Senhor Ministro da Educação e Ciência, e ao Senhor Vice-Presidente da Câmara Municipal do Porto, Engº. Vladimiro Feliz, por também ter encontrado disponibilidade na sua agenda para estar connosco, em representação do Senhor Presidente da Câmara Municipal do Porto. Os nossos agradecimentos, por todo o apoio que têm dispensado à Fundação Bial, ao Conselho de Reitores das Universidades Portuguesas – na pessoa do seu Vice-presidente e Reitor da Universidade do Porto, Prof. José Carlos Marques dos Santos – e à Ordem dos Médicos – na pessoa do representante do seu bastonário e Presidente da Secção Regional do Norte, Dr. Miguel Guimarães.

O nosso obrigado também pela presença do Senhor Bastonário da Ordem dos Farmacêuticos, Prof. Carlos Maurício Barbosa e demais autoridades presentes. Muito obrigado a todos pela vossa presença. Ainda o nosso reconhecido agradecimento aos membros da Comissão Organizadora deste simpósio e, nomeadamente, ao seu presidente, Prof. Fernando Lopes da Silva, pelo excelente trabalho desenvolvido.

Não posso também deixar de expressar a minha gratidão - e lembrar - o nosso querido Prof. Nuno Grande, que durante tantos anos representou o Conselho de Reitores das Universidades Portuguesas na Administração da Fundação Bial e que hoje não pode aqui estar connosco por, desafortunadamente, se encontrar há largos meses retido no seu leito por motivos de saúde.

Os Laboratórios Bial iniciaram a sua atividade mecenática no apoio à Ciência que se faz em Saúde em 1984, com a criação do Prémio Bial, que é atualmente um dos maiores prémios europeus na área da Saúde. Mas a Fundação Bial – instituição independente, sem fins lucrativos, constitu-

ída e administrada em conjunto pelo Conselho de Reitores das Universidades Portuguesas e pelos Laboratórios Bial e considerada de utilidade pública pelo Governo português – só foi formalmente constituída em 1994, na altura da criação das Bolsas de Investigação Científica Bial.

Com este sistema de bolsas, lançadas de dois em dois anos, pretendíamos – e pretendemos – apoiar a investigação científica que possa proporcionar o esclarecimento relativamente à atividade do nosso Sistema Nervoso Central, no âmbito da Psicofisiologia e, ao mesmo tempo, também o esclarecimento de muitos fenómenos relativamente estranhos, descritos ao longo da História e evidenciados nos nossos dias, mas ainda sem cabal explicação científica, no âmbito da Parapsicologia. Por isso temos vindo a apoiar a investigação nestas duas áreas, há já dezoito anos.

A organização destes simpósios, agora em nona edição, teve em vista, por um lado, a apresentação pública dos resultados das investigações realizadas com o nosso apoio, mas, por outro lado, convocar os melhores investigadores destas áreas para apresentarem os seus pontos de vista e, finalmente, criarmos condições para uma real e frutuosa aproximação entre a Psicofisiologia e a Parapsicologia, proporcionadora de um diálogo enriquecedor, do cruzamento de saberes e da organização de projetos conjuntos. Talvez tenhamos sido pioneiros nesta aproximação.

E aqui estão, uma vez mais, muitos dos nossos bolseiros para apresentarem os resultados do seu trabalho. Temos 44 posters, com resultados definitivos, em exibição na galeria ao lado deste salão e teremos 15 apresentações orais, que foram selecionadas para serem apresentadas nas tardes dos dias 29 e 30. A generalidade dos resultados, provisórios ou definitivos, poderá ainda ser consultada na nossa página na Internet, nomeadamente através de computadores disponíveis para esse efeito na galeria aqui ao lado. Os nossos bolseiros estarão disponíveis para discutir com todos os participantes os resultados dos seus trabalhos, especialmente nessas duas tardes, após as apresentações orais.

Mas a Fundação Bial está preocupada em dar um bom contributo para o avanço científico nesta área. Por isso, por iniciativa da Prof. Maria de Sousa – atual representante do Conselho de Reitores das Universidades Portuguesas na nossa administração – encomendámos uma avaliação dos resultados do trabalho dos nossos bolseiros. A Dra. Marta Lima, do IBMC, e a Dra. Sara Berény, da Faculdade de Psicologia do Porto,

apresentam-nos essa avaliação num poster que se encontra à entrada da galeria. No período de 1994 a 2010 a Fundação Bial apoiou 387 projetos de investigação, envolvendo 1.267 investigadores de 27 países. Estes projetos apoiados, que representam 32% do total dos solicitados, dividem-se pelas áreas da Psicofisiologia (44%), da Parapsicologia (41%) e envolvendo estas duas áreas (15%). Apenas 2% dos projetos foram encerrados sem quaisquer resultados.

Das investigações realizadas resultaram, até novembro de 2011, 444 publicações, 163 das quais em revistas internacionais indexadas com um fator de impacto médio de 3,9 e com 1.252 citações. Vinte e quatro destas publicações tiveram lugar em revistas com fator de impacto superior a 5.

Felizmente, o nível de qualidade das publicações tem vindo a aumentar. Consideramos estes resultados relativamente satisfatórios e desejamos dar continuidade, com níveis de qualidade crescentes, ao trabalho que vimos incentivando.

Por isso, tenho o gosto de anunciar que a Fundação Bial vai promover um novo pacote de bolsas, cobrindo as mesmas áreas e com características semelhantes às anteriores. O regulamento e o formulário para concurso estarão disponíveis, a partir da próxima segunda-feira, no nosso espaço www.bial.com e o prazo de entrega das candidaturas terminará em 31 de agosto próximo. Cada projeto poderá ser realizado num período máximo de três anos e poderá beneficiar de um subsídio pecuniário entre 5.000 e 50.000 euros. Sublinho que não apoiaremos projetos de patologia ou de terapêutica, mas apenas Psicofisiologia e Parapsicologia.

Quanto a este simpósio, agradeço à Comissão Organizadora ter conseguido trazer até nós um tão rico conjunto de palestrantes, que nos fazem antever excelentes preleções, durante um conjunto de dias que esperamos sejam muito agradáveis para todos. Desejamos um frutuoso diálogo e que possamos todos sair daqui no próximo sábado enriquecidos com o que aqui aprendemos.

Talvez valha a pena chamar a vossa atenção para a novidade do *evening encounter* de sexta-feira ser moderado pela jornalista Andreia Azevedo Soares e transmitido em direto através do canal TVU da Universidade do Porto. Acresce que cada um dos participantes poderá, nessa noite, trazer consigo um acompanhante que deseje participar nessa sessão.

Continuamos a pensar que é enorme o terreno a desbravar nas áreas da Psicofisiologia e da Parapsicologia, com um imenso potencial para o esclarecimento da Humanidade, quer na perspetiva física, quer na perspetiva espiritual. É nossa convicção que cabe à Ciência esse papel esclarecedor, que possa desmistificar algumas fantasias, mas também contribuir para que o Homem aproveite melhor todas as suas potencialidades e se enquadre melhor na realidade universal.

E nós, na Fundação Bial, temos muita satisfação em podermos ser úteis ao apoiar aqueles que – a maioria das vezes na discrição dos seus laboratórios – trabalham arduamente, segundo o rigor do método científico, para que esse esclarecimento se torne possível.

A todos a nossa gratidão pela vossa presença, o meu obrigado pela vossa atenção e os votos de um excelente simpósio.

DISCURSO DO PRESIDENTE DA COMISSÃO ORGANIZADORA

Fernando Lopes da Silva

Boa noite a todos, muito especialmente à mesa, à Prof. Doutora Leonor Parreira, que eu conheço muito bem, não como Secretária de Estado mas como colega e amiga há muitos anos, e ao Senhor Reitor também e a todos os outros membros da mesa.

Quero dizer algumas palavras em inglês na medida em que os nossos colegas que estão aqui e que participam neste Simpósio não têm ainda tempo para aprender português assim tão rapidamente.

I would like to introduce the Symposium because as a chair of the Symposium Committee I would like first to thank the Bial Foundation for giving us the opportunity of getting this entire people here that are going to lecture on these coming days.

The Symposium Committee used as topic Sleep and Dreams. You may think this is actually an occasion where you can try to get answers to all the questions about sleep and dreams that you think know about and perhaps you may end up with more questions that you had at the beginning. That is usually the case when science is actually so active as in this field. I hope that you get sufficient profit of these three days of discussion and particularly, as Dr. Luís Portela already mentioned, we will have this time an encounter on Friday evening where you can directly put questions and discuss with faculty this staff here and that I think it is a very good opportunity to get active information about the questions that you have on this field.

This is Sleep and Dreams and I think I can make some comparisons with the known basketball team of the USA that it is called the "Dream Team". So we have now here a group of speakers that is a "Dream Team" to talk about dreams and sleep and this is really a wonderful occasion that I hope you will really enjoy very much. This is actually my main desire now: to finish here by expecting that you will have a nice time in participating also, not only listening, but participating on this meeting.

Thank you.

DISCURSO DO PRESIDENTE DA SECÇÃO REGIONAL NORTE DA ORDEM DOS MÉDICOS em representação do Bastonário da Ordem dos Médicos

Miguel Guimarães

Muito boa noite a todos. Excelentíssima Senhora Prof. Doutora Leonor Parreira, Secretária de Estado da Ciência, é com enorme orgulho que a temos presente entre nós aqui na Secção Regional da Ordem dos Médicos, Senhor Eng. Vladimir Feliz, Vice-Presidente da Câmara Municipal do Porto, Senhor Prof. Doutor José Carlos Marques dos Santos, Reitor da Universidade do Porto, também é com muito prazer que o temos aqui nesta casa, Senhor Doutor Luís Portela, Presidente da Fundação Bial, Senhor Prof. Doutor Fernando Lopes da Silva, Presidente da Comissão Organizadora deste Simpósio. Distintos convidados e participantes, bem-vindos ao 9º Simpósio da Fundação Bial "Aquém e Além do Cérebro", este ano dedicado ao tema Sonho e Sonhos.

Em nome do Senhor Bastonário da Ordem dos Médicos e do Conselho Regional do Norte quero felicitar a Fundação Bial e a Comissão Organizadora nas pessoas dos seus Presidentes pela realização deste 9º Simpósio mais uma vez na Casa do Médico, na Ordem dos Médicos, também a casa do Doutor Luís Portela, médico como sabem.

É para nós uma honra poder contar com a presença de tão distintas personalidades nas áreas de investigação e da ciência. A Fundação Bial tem desde 1994 incentivado o desenvolvimento das ciências e da investigação científica na área da Saúde, através da promoção de várias iniciativas com destaque para o Prémio Bial, as Bolsas de Investigação Científica e o Simpósio Aquém e Além do Cérebro, onde o debate das ideias e dos trabalhos científicos acontecem. Nesta medida, a Fundação Bial tem dado um inestimável contributo para o desenvolvimento da comunidade científica e da sociedade, quer ao nível nacional quer ao nível internacional.

No atual momento de crise de valores e princípios, englobados na crise económica e financeira que Portugal e a Europa atravessam, a Saúde, a Educação, a Justiça e a Investigação devem constituir um núcleo essen-

cial para recuperar o bom senso da gestão do saber, do conhecimento e da capacidade de decisão. Todos os contributos para alcançar estes objetivos são naturalmente bem-vindos e a Fundação Bial tem dado, ao longo de todos estes anos, um exemplo ao país que pode e deve ser seguido. A todos os bolseiros e investigadores os nossos Parabéns pela participação grandiosa que dão a este evento.

Desejo a todos os participantes um Simpósio de excelência, onde o debate e a troca de experiências e de conhecimentos sejam férteis.

Muito obrigado pela vossa atenção.

DISCURSO DO VICE-PRESIDENTE DA CÂMARA MUNICIPAL DO PORTO em representação do Presidente da Câmara Municipal do Porto

Vladimiro Feliz

Muito boa noite a todos. Senhora Secretária de Estado da Ciência, Senhora Prof. Doutora Leonor Parreira, é um gosto recebê-la na nossa cidade, é sempre bem-vinda e, nomeadamente, a eventos como este; Senhor Prof. Doutor Marques dos Santos, parceiro de muitos eventos e de muitas lutas, Senhor Dr. Miguel Guimarães, Presidente da Secção Regional da Ordem dos Médicos, Prof. Doutor Fernando Lopes da Silva, Presidente da Comissão Organizadora do 9º Simpósio Bial, Senhor Doutor Luís Portela e, deixo-o para o fim porque é com muito gosto que, institucionalmente e pessoalmente, estou presente hoje por razões diversas.

Porque a sua (Doutor Luís Portela) atitude perante a Cidade, o seu compromisso diário com a Cidade, nos faz estar presente nas iniciativas promovidas pela Bial com outro sentimento, que vai bem para além daquele que é o sentimento institucional. A responsabilidade social que a Bial põe na sua atividade tem muito a ver com a cultura e com o ADN que conseguiu trazer a esta empresa. E a cidade a si também lhe deve estar por muito agradecida; o papel da Bial, importantíssimo não só na dinamização do tecido económico local, como regional e nacional, uma empresa global que mostra como uma aposta no empenho, na perseverança e, acima de tudo, uma forte aposta na promoção de inovação e da excelência, podem fazer do Porto e do Norte um espaço de eleição para acolher investimentos com esta dimensão.

O Porto é sem dúvida, e não me cansarei de dizer enquanto exercer estas funções e depois noutros fóruns, o ecossistema adequado para fixar inovadores, para fixar empreendedores, para fixar investigadores, para fixar investimentos de excelência. O Porto tem a maior Universidade, e permitam-me a melhor do país, o Porto tem o maior Politécnico e, também, provavelmente o melhor do país, o Porto tem entidades de inovação, de investigação e de desenvolvimento de referência, nomeadamente, na

área das Ciências da Vida e na área das Tecnologias. Se ao Porto juntarmos Braga, Guimarães, Aveiro, temos por ano 5.600 licenciados na área das Ciências, das Tecnologias, das Engenharias e das Matemáticas. Temos vias de comunicação de referência, temos um aeroporto que está no top 3 Europeu ao nível da qualidade de serviço. Temos uma rede viária que nos liga à Europa, temos redes de comunicação de nova geração que nos ligam virtualmente a todo o mundo e temos um espaço muito especial, que é uma rede metropolitana de fibra ótica que poucos conhecem que ligará todo o meio de Ensino até ao final do primeiro semestre deste ano, e ligará todo o ensino desde o Pré-Escolar ao Ensino Universitário da cidade, ligando um conjunto de outras entidades de interesse público na cidade.

O Porto tem excelentes características para viver, que ainda mais foram evidenciadas com o Prémio que hoje foi divulgado. O Porto foi considerado, pela Associação Europeia de Consumidores, como o melhor destino para viajar em 2012, e um destino que é bom para viajar é, obviamente, bom para viver, e portanto não temos dúvidas que as condições de contexto local estão criadas. Resolvidos os custos de contexto global, sejam ao nível fiscal, em que é preciso maior estabilidade para que os investidores saibam as regras do jogo a médio e longo prazo, condições preferenciais para fixar investigadores e quadros de elevado, potencial, balizando por exemplo o escalão de IRS para estes quadros; a nível judicial uma justiça acima de tudo mais célebre; a nível da educação uma política de educação que premeie a excelência e que aposte no rigor, uma verdadeira política de inovação e empreendedorismo que proteja e forme para o risco uma lei laboral flexível e uma maior autonomia das universidades, ajudar-nos-ia com certeza a termos no Porto e no Norte uma saída para a crise.

Não vos maçando mais, gostaria de felicitar a Fundação Bial por esta excelente iniciativa. São eventos como este que, gradualmente, ajudam a construir este ecossistema.

Permitam-me também, como Vereador do Turismo, salientar a importância que eventos como este têm para a promoção do Turismo Científico na cidade, um produto importantíssimo e que privilegiamos na Política Autárquica e com isso temos um bom exemplo, o Programa Porto Cidade da Ciência, que visa não só promover a Ciência mas tentar, dia após dia, atrair melhores eventos e eventos como este para a cidade do Porto.

Obrigado, parabéns e conte sempre com o empenho da Câmara Municipal do Porto na promoção destes eventos.

DISCURSO DO REITOR DA UNIVERSIDADE DO PORTO em representação do Conselho de Reitores das Universidades Portuguesas

José Carlos Marques dos Santos

Muito boa noite a todos. Seja permitido um cumprimento especial à Senhora Secretária de Estado da Ciência, Professora Leonor Parreira, que também vemos hoje com muito gosto nesta sessão, cumprimentar também o Senhor Doutor Luís Portela, o Senhor Vice-Presidente da Câmara Municipal do Porto, o Senhor Representante dos Bastonários, o Senhor Professor Lopes da Silva, Presidente da Comissão Organizadora deste Simpósio.

É com muito gosto que estou aqui hoje, com muita satisfação por estar a representar o Conselho de Reitores das Universidades Portuguesas e, portanto, todas as Universidades Públicas Portuguesas nesta sessão de abertura do Simpósio Aquém e Além do Cérebro, uma organização da Fundação Bial de que o CRUP tem o gosto especial de ser fundador e administrador em conjunto com os Laboratórios Bial.

São estes Laboratórios Bial que de facto devem ser louvados e reconhecidos pela criação desta Fundação, que tanto se tem empenhado e contribuído para a investigação da mente e do comportamento humanos, tanto nos aspetos físicos como do ponto de vista espiritual. De realçar em particular a atribuição de Bolsas de Investigação, porque vi mais de 2000 contando os apoios, e os Prémios Bial de Medicina e de Medicina Clínica, de grande valor, muito atrativos e que despertam sempre muitos concorrentes.

Queria realçar em particular o papel da Fundação Bial e em particular do Doutor Luís Portela no apoio à investigação científica nas áreas em apreço e muitas outras. Seja permitida uma louvação especial ao Doutor Luís Portela, que é uma pessoa que eu me habituei a admirar especialmente porque é um empresário de grande sucesso e um apostador forte na inovação. Mostrou que é possível, em Portugal, desenvolver medi-

camentos comercializáveis internacionalmente e para além disso tudo tem uma dedicação cívica fora do vulgar, entregando-se a participar em imensas organizações de que a cidade do Porto é um dos receptários mais importantes. É o Presidente do Conselho Geral da Universidade do Porto e tem sido, de facto, uma pessoa excecional na atividade que desenvolve de empresário e como apoio à investigação. É um exemplo, tanto os Laboratórios Bial como o Doutor Luís Portela, que gostaríamos de ver multiplicado abundantemente para que a investigação científica tivesse ainda mais apoios para poder trabalhar com outros centros de decisão estrangeiros muito mais bem financiados do que nós.

Às vezes penso que fazemos milagres em Portugal. Comparando os níveis de financiamento que nós temos com outras Universidades ou outros Laboratórios e os resultados que conseguimos alcançar, de facto conseguimos autênticos milagres. E se mais empenho como este houvesse, certamente melhores resultados conseguiríamos obter. E fica aqui um desafio para que outras entidades se dediquem a financiar a investigação em Portugal nos próximos tempos.

O tema deste ano Sonho e Sonhos, é muito sugestivo e diz respeito a algo que, ao que parece, ainda não sabemos explicar convenientemente. Estando envolto em algum mistério, talvez este Simpósio contribua para desvendar mais um pouco esse mistério e, quem sabe, para nos dizer como transformar em realidade o sonho que todos temos neste momento de ver esta crise ultrapassada.

Queria aproveitar para felicitar os bolseiros da Fundação Bial que aqui apresentam hoje resultados da sua investigação apoiada pela Fundação Bial e saudar particularmente todos os especialistas internacionais que darão a conhecer o que de melhor se faz nas áreas do Sono e do Sonho por esse mundo fora.

Renovo as minhas felicitações à Fundação Bial na pessoa do seu Presidente, o Doutor Luís Portela, por esta missão regular de dois em dois anos. Aqui estamos nesta organização, que sempre atrai imensos participantes com grandes resultados.

Desejo a todos os participantes uma atividade extraordinariamente profícua, estando certo de que todos sairão mais enriquecidos no final deste Congresso.

Muito obrigado e boa noite.

DISCURSO DA SECRETÁRIA DE ESTADO DA CIÊNCIA em representação do Ministro da Educação e da Ciência

Leonor Parreira

Senhor Doutor Luís Portela, quero começar por cumprimentá-lo como Presidente da Fundação Bial, cumprimentar todos os membros da mesa. O Senhor Reitor, Professor Marques dos Santos, nós vemo-nos com frequência e é sempre um gosto encontrá-lo. Senhor Vice-Presidente da Câmara Municipal do Porto, quero agradecer as boas-vindas que me deu - esta é a minha terra também, portanto sinto-me sempre em casa. Quero cumprimentar também o Senhor Dr. Miguel Guimarães, Presidente da Secção Regional Norte da Ordem dos Médicos. Senhor Professor Fernando Lopes da Silva, amigo de longa data, a quem eu muito admiro e a quem a ciência portuguesa muito deve pelo seu esforço, dedicação e inteligência ao longo dos anos. A todos os presentes - e aqui estão muitos amigos, muitas caras conhecidas, todos os meus cumprimentos. *Professor Hobson it was a great pleasure to meet you and I was telling before that I could not think of a better way of finishing this working day, at least for me, than listening to your lecture, wishing it would be extremely interesting.*

Quero felicitar, evidentemente, a Fundação Bial. É muito interessante e muito importante ver esta parceria notável de uma Fundação, de uma empresa de enorme sucesso, e da sua ligação íntima à proteção da ciência.

Os números que o Senhor Doutor há pouco referiu são verdadeiramente impressionantes. A Professora Maria de Sousa fez um levantamento objetivo do que se passou ao longo deste tempo com os projetos que foram apoiados em áreas de cruzamento, como o Senhor Doutor referiu da sua aposta pela ciência. A ciência, evidentemente, tem por missão - por desejo, por objeto - a compreensão do desconhecido. É essa a missão da Ciência e portanto explicar "Behind and Beyond the Brain" através da ciência é, de facto, um empreendimento de ponta a que a Fundação Bial tem dado uma contribuição notável.

Quero felicitar todos os que aqui estão. Os tópicos que vão ser discutidos, o próprio título do encontro em si próprio e o tópico deste ano,

mostram de facto uma coisa curiosa - porque tanto se diz que a compreensão do cérebro é a última fronteira. Eu estou aqui rodeada de neurocientistas; eles se calhar partilharão comigo este conceito de que é a última fronteira. Eu não sei se é porque uma vez atingida essa fronteira, e seguramente que a ciência a atingirá, seguramente outras fronteiras vão surgir e portanto não ficaremos seguramente pela última mas estamos a caminho dela.

Quero desejar a todos uns excelentes dias de trabalho; vai ser seguramente um encontro muito interessante pelo que vejo de todas as discussões que vão estar em curso nestes dias, e mais uma vez felicitar a Fundação Bial por este magnífico trabalho de coesão entre a ciência e a produção verdadeiramente importante e eficaz do que é a empresa Bial.

Muito obrigada a todos.

CONFERÊNCIA INAUGURAL
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DREAM CONSCIOUSNESS

Allan Hobson [*]

Dreaming is the subjective awareness of brain activation in sleep. Dreaming is regarded by psychoanalytic psychology as an unconscious mental process. But dreaming is not unconsciousness mental activity. It is rather an altered state of consciousness. If we change our definition of dreaming it changes everything. We get rid of the notion of dreaming as an unconscious mental state: instead dreaming is a state of consciousness which cannot be remembered when we are in the other state of consciousness which is waking. There is waking consciousness on the one hand and dreaming consciousness on the other; it is interesting both states of consciousness are very different from each other and very similar to each other. In this paper, I will explain why and what this means.

Several aspects of my comparison of waking and dreaming lead me to believe that dreaming is a state of consciousness that actually precedes and benefits waking consciousness. Instead of being the follower of waking, dreaming is in fact the progenitor of waking. Sleep comes first and awakening comes second. This is a very radical shift in emphasis. We have always thought that sleep follows waking (and of course it does) but it also precedes waking. Every night is followed by a day and every day is followed by a night. We have been almost exclusively interested in the way that the night follows the day and we have ignored the way that the night might anticipate the day.

I consider the possibility that two very central states of consciousness - dreaming and waking - interact in a very important way such that waking consciousness actually depends on dream consciousness rather than the other way around.

If you take this point of view seriously then your scientific research is going to change very radically. First of all you begin to think dreaming and waking as subjective states which are both similar and different. They

[*] Harvard Medical School, Boston, EUA.

are similar and they are both very active, they are very dynamic states of the mind; on the one hand all of the sensory information comes from the outside world when we are awake, but entirely from the inside world in dreaming. So the brain is able to create an activation simulation of waking. This is an important part of my new theory: dreaming is providing the brain with a virtual reality program that it uses to evaluate external reality.

One nice thing about this new paradigm is we can work on subjective experience. Dreams are not to be interpreted until they are measured and compared with wake state consciousness. We can do formal analysis just with a paper and pencil. We do not need even a laboratory to do this sort of work. Everyone can be involved in studying consciousness and studying dreaming simply by paying attention to one's own subjective experience. I think the scientific opportunities of this sort of approach are enormous and that any psychology department or high schools or even junior high schools could be doing this work.

The main difference here is to emphasize the formal properties of dreams rather than the content. For example, we ask what sorts of sensory experiences occur in the two states. In waking, we process information from the outside world and in dreaming all of the information comes from what we have in the brain. There are formal differences between waking and dreaming that are extremely robust and very impressive. For example, dreaming is extremely visual, which means that the visual system is capable of creating imagery with the eyes closed, in the dark. That means that the brain is not only anticipating waking but is actually simulating waking. Furthermore, 80% of dream content is not a reproduction of experience that happened in preceding waking; it might therefore be a prediction, a creative expectation of what might happen in subsequent waking. Another example is that in waking we remember quite well but in dreaming we remember very poorly. Indeed that is the real reason for considering dreaming to be an unconsciousness mental state. Dreaming is simply unremembered when we are awake.

Amnesia is the only neatly qualitative difference in terms of consciousness between the two states. Waking is characterized by rich memory, dreaming by extremely poor memory. So we have a contrasting situation with waking as external reality and dreaming as internal reality. Waking is strong memory and dreaming is weak memory. If we could

understand the way that the brain engenders its own visual information and the way arranges not to remember dreams, we would be a several steps ahead of the game.

Now, fortunately, we are able to do just this because sleep and dreams are not just a human phenomenon. All mammals have sleep and they all have sleep that alternates between deep or non REM sleep and REM sleep. Most of the human dreaming that is very intense and hallucinatory has its source in REM sleep. Using this data, I can map between psychology and physiology. Assuming that REM (whether or non-human animals dream) is the same in all animals. I ask myself what are the differences in subjective experience and what are the differences in terms of brain activity. Can we make some sense out of our comparisons of those states?

We can measure the brain states in both waking and dreaming and we have an animal model of REM sleep in which we can ask these questions at the level of cells and molecules. You now understand why I claim the science of sleep and dreams is in fact the science of consciousness. I think I have got my foot in the door, that the door is partially open and we are starting to study the single most important aspect of our humanity, namely our consciousness. About 20 years ago all we could do was speculate about these matters. Philosophers came up with some remarkable speculations. Freud was certainly one of them. Freud was a speculative philosopher of great skill but Freud was not sitting where I am sitting. He wasn't to be able to use brain science to help him with psychology of dreams because there was no brain science in 1895. I think that represents a remarkable opportunity that Foundations like Bial should take into account when thinking about its research program because this is a unique scientific opportunity.

When we study the physiology of sleep either in humans and/or in animals we notice three things that are important. One, waking and dreaming are both associated with the activation of the brain, so the brain is very active in both cases. You would not think that the brain is activated in sleep but PET scan studies show there are certain parts of the brain that are more activated in REM sleep than they are in awaking. So the activation is what the two states have in common. What differentiates the two states are two general factors. One is that your eyes are open in waking and receive sensory information. You can operate on the world

in waking whereas in dreams the sensory gates are closed. You cannot receive information because it's actively excluded. Furthermore, you cannot send motor signals back out into the world because motor output, like sensory input, is blocked. So, your activated brain in REM sleep is offline when compared with waking. We have so far identified two factors: Activation (A) Input-Output Gating (I). There is a third factor. It is Chemical Modulation (M). The three factors are AIM. Since we can quantify all three dimensions, AIM is a Three-dimensional State Space Model. Chemical modulation (M) is probably the most important part of the story and is the one my reputation depends upon.

To my great surprise, the neurons of the brain stem (a little part of the brain between our ears), changes the chemistry of the entire brain in REM. I spent 20 years of my life working on a piece of brain and this is smaller than my little finger nail. It is truly amazing just is so pathetic how little we know about the brain and how little I have learned. I am persuaded that this is just the beginning and that it will take us another 500 years to do the brain any kind of justice.

Modulation (M) allows you to be awake and understand this lecture - think about it, remember enough so you could to tell somebody about it. You have got to be active with respect to your aminergic neurons. Aminergic neurons include the norepinephrine containing neurons, the serotonin neurons, and the histamine neurons. All these neurons that we thought might be more active in dreaming turn out to be much more active in waking. They are subtracted from brain activation when you go to sleep and they are completely shut off during REM! So, dreaming is a state of offline brain activation with aminergic demodulation. So, Factor M distinguishes dreaming and waking as radically anything that could be imagined. At the same time that the aminergic system is decreasing activity, the cholinergic system is increasing. The cholinergic system is activated in waking, too. Were it not for aminergic modulation otherwise, you would be hallucinating right now as you are listening to me instead of three hours from now when you get into your bed and the aminergic neurons stop firing. The cholinergic system would then be unchecked and you would have a wild dream. The brain changes its mind because it changes its chemical composition. As well as being offline and activated, it is chemically altered.

This is what I mean when I say that dreaming is an altered state of consciousness. The alteration is a function of physiological changes. That does not mean that subjective experience does exist and it does not mean that the brain is not a mind. I think of the brain and the mind as a unified system. I think the mind is being our subjective experience of the brain and our brain of being the objective experience of our mind. When you take this point of view you not only solve the mind-brain problem but you also realize that subjective experiences are the only way that you have to understanding your brain directly. This is because you do not really experience your brain in any other way than through your mind. I think that subjective experience is neglected as a method for studying the brain. That is a radical position to take but I think it is something that we have to take more seriously.

Waking and dreaming are altered states of consciousness, I have told you a little bit about why they are similar and why they are different. Now what I would like to introduce is a concept that is extremely alien, very hard to understand: protoconsciousness.

Protoconsciousness is a term I made up to try to capture the notion that dreaming may precede waking as well as conveying the idea that dreaming is more important than waking in some aspects. It may be preparing the brain to be awake. Proto also means before - in time, earlier than. And there is evidence that is not only that night precedes the following day, but also that REM sleep is more prominent in young animals. In fact, it occurs most frequently to the fetus in the uterus. REM sleep occurs before we are born! So, your brain is already self-activated when you are floating around inside your mother's belly. And that is a very remarkable story because what the brain is doing, is making itself ready to be functional. Throughout childhood, REM sleep is still 4 times as very prevalent as it is in adulthood. Finally a child is able to go to school at three or five years old. This is a long process of development and it is an active process that occurs in sleep.

REM sleep precedes waking by several months or years. It is not just the night precedes each day. Dreaming (or something like dreaming) is the first state of consciousness that we experience. I call that early state protoconsciousness because although I really do not think that fetuses dream but I do think they might experience something "subjective." I

am sure that babies and young children do so. When I use the term protoconsciousness I describe two different kinds of consciousness. One is primary (akin to dreaming) and the other is secondary (akin to waking).

Primary consciousness is the kind of conscious that we share with other animals: it consists of perception, emotion, and memory. Secondary consciousness – consisting of language, abstraction, mathematics, science, and literature – is probably exclusively human. A few primates may come close to this state but secondary consciousness is a uniquely human experience. Primary consciousness is a state that we get close to when we dream. I cannot think when I dream. In my dreams, I have very strong sensations and perceptions, very strong emotions, a very strong sense of self-agency. The dream is always about me, I am always at the center of the dream. I think these important formal features that must be distinct very early in development even in the uterus. And that self agency moves in a space just as I move in my dreams. I am always in some space, so the dream is always about me. My idea is that at very early stage in development, there is a protoself that moves in a protospace: moves in a space and also feels in that space. The seeing and hearing the rest of the dream sensation is probably a sort of preparation for waking.

It is interesting that we also experience strong emotion in dreams. Now emotion has been considered a symptom by psychoanalysis. I suppose a lot of you think that anxiety is a symptom. But I say that anxiety is not basically a symptom, anxiety is basically part of cognition. When you feel afraid it is a very important feeling; when you feel happy is a very important feeling; when you feel angry it is a very important feeling. You are born with the capability of having all these emotional experiences as well as having a sense of agency moving in a space and having the capacity to feel and to have emotions. So emotion is an integral part of primary consciousness. I think emotion occurs in all mammals. All mammals have REM sleep. This could be just a coincidence but I think it is not. It leads you to wonder what is the function of REM sleep at maturity. Could you be activating your brain in order to exercise primary consciousness as you also facilitate incorporation of learned information into the genetic program?

One part of this very surprising and completely counterintuitive story is that temperature regulation depends on REM sleep. If you take

REM sleep away from a mammalian animal, it cannot regulate its body temperature. Body temperature control is establishing a very narrow window for the operation of the brain. The brain is not functional except in a very narrow temperature range. Think of yourself having a fever or feeling cold and you will immediately appreciate how important this is. If you have a fever you cannot read, you cannot think, and you wait until your fever subsides. And if you are cold, all you can do is try to get warm. It is very important for the organisms that have complex brains like mammals have, to regulate body temperature. Birds are the only non-mammalian animals that regulate body temperature and they are the only non-mammalian animals that have REM sleep.

Now the thermal regulation story is part of a very important new approach to dream function that I have been taking with Karl Friston in London. Friston is a REM sleep mathematically sophisticated young psychiatrist who is interested in free energy. I did not know what free energy is until I met Karl. Karl says that complex systems (and the brain is certainly a very complex system), have to be very careful about managing free energy and one of the ways they do this is to keep the temperature extremely constant. The other thing that a complex system has to do to minimize surprise to keep it from going into a dysfunctional state. To minimize surprise, the brain projects expectations onto the world. It thus predicts the consequences of its own activity. This is what I mean by a Virtual Reality Program. All aspects of waking consciousness are in fact a projective experience not just the passive receipt of experience. You project your virtual reality model into the world and you compare the information that comes into the system from the outside world to the model in your brain. The free energy notion very strongly enriches the theoretical structure that I am developing.

This may all seem a little bit obscure to you. After 40 years of doing science on sleep and dreams, I feel that I have finally got my hands on a functional hypothesis. To get to this point, we had to get away from interpreting dreams. We had to think more formally, and we had to do physiology.

How can we test the theory? Well this is admittedly very difficult but there is one impressive phenomenon that enables us to begin to test the theory: Lucid Dreaming. Steve LaBerge put this phenomenon on

the scientific map and was a pioneer in the establishment of the science of lucid dreaming. Certain people had written about lucid dreaming (and they were credible people) but LaBerge brought lucid dreaming into the laboratory and what I am telling you is based very strongly on his work. With Ursula Voss, I have been studying lucid dream theory using quantitative EEG imagery. These images quantify electrical power of the EEG from 30 electrodes. When a subject is awake there is a lot of activity in the frontal area of the brain. Many scientists have thought that secondary consciousness was likely to be a frontal lobe function. You have to have your frontal lobe in order to know what day it is, to pay attention, to ignore, and what to believe or not to believe. These matters are secondary consciousness features and they are known to be frontal lobe functions. When the subject goes to sleep and enters REM and starts to dream, the frontal lobes are not reactivated. No wonder you cannot think, no wonder you cannot remember, no wonder you cannot recognize that you are dreaming. You are completely controlled by the automatic activation of the brain and it is coming from the back of the brain.

Lucid dreaming is a functional preparation, a split brain preparation in which the frontal lobes are out of the picture. In lucid dreams, the frontal lobe comes back into the picture as in waking. It turns out the frontal lobe activation of lucid dreaming is exactly midway in intensity between the level of non lucid dreaming (low) and REM sleep dreaming (high).

When we dream lucidly, the brain is both awake and dreaming at the same time. This is a very exciting concept because we have always thought it was either one thing or the other. That you are either awake or you were dreaming. Now we know that you can be doing both at the same time. In psychiatry, this is called dissociation. Dissociation is the separation of one characteristic from another characteristic. The brain is capable of dissociation and the brain dissociates automatically in lucid dreaming.

We have also done a study in which we record normal subjects sleeping at home. We have got something like 800 reports. We score the reports for the external generator imagery; hallucinations and sharp rise from a low point in waking to very strong peak in REM sleep. When we also score the same reports for measures of secondary consciousness, thinking goes in exactly the other direction.

Summary and Conclusions

Instead of thinking of dreaming as an unconscious mental state, I propose that we think of it as an altered state of consciousness. The most impressive difference between dreaming and awaking is the failure of memory in dreaming. But dreaming is very good at certain things that waking is very poor at. Dreaming is very good in generating images. I do not know about you, but I do not hallucinate when I am awake, but when I dream I do this very easily. I use a term like hallucination because I am a psychiatrist. Dreaming is a model for mental illness in which your capacity to hallucinate is increased and your capacity to believe things that can not possible to be true is increased but your capacity to evaluate those things to think about them critically, is decreased. As in mental illness, the capacity to think goes down in dreams, while the capacity to hallucinate goes up. In parallel with this change, aminergic activity goes down, while cholinergic activity goes up. There is a reciprocal chain in the mind that parallels the changes in the brain. This is exactly what would be expected of a unified system.

PALESTRAS
LECTURES

SLEEP, MEMORY AND DREAMS: PUTTING IT ALL TOGETHER

Robert Stickgold *

A decade of research has produced a wealth of converging evidence of sleep's important role in offline memory processing. Studies in flies[4], birds[5], rodents[6], cats[7], and humans[8] all point to a critical role for sleep in the offline *evolution* of memories. We use the word "evolution" in place of the more commonly used "consolidation," because the scope of sleep-dependent memory processing extends far beyond the initial idea of memory consolidation as a process that stabilizes initially labile memory traces[9] (but see[10]). Sleep does stabilize memories[11], but it can also enhance[12], integrate[13], and unbind[14] memories. It can selectively retain salient portions of a memory[14], extract the gist from complex memories [15], discover, in memories of large data sets, the rules controlling their behavior[16], and enhance insight[2]. Thus, we use the term "memory evolution" to reflect both the qualitative changes that can occur during this processing, and the long time course over which such changes are known to occur. While the longer term changes to memories that occur over years or even decades have not been shown to be sleep-dependent, physiologically similar sleep-dependent changes have been demonstrated over single nights.

Sleep-dependent memory processing

Two examples can give a sense of this range of sleep-dependent processes. In 1994, Karni *et al.*[12] reported that learning of a visual texture discrimination task was enhanced by post-training sleep. The task involves identifying the orientation of an array of three diagonal bars embedded in the lower left quadrant of a field of horizontal bars (Fig 1, left), while maintaining fixation on a letter at the center of the screen. On each trial,

* Beth Israel Deaconess Medical Center and Harvard Medical School, USA.

a stimulus is flashed briefly, followed after a variable interstimulus interval (ISI), by a mask screen. Over 1,000 trials, a threshold time is determined that represents the minimal ISI permitting 80% accuracy in identifying the orientation of the diagonal bar array. When subjects are retested at a later time, a reduced threshold time is seen, but only if there has been at least one night of intervening sleep (Fig 1, right).

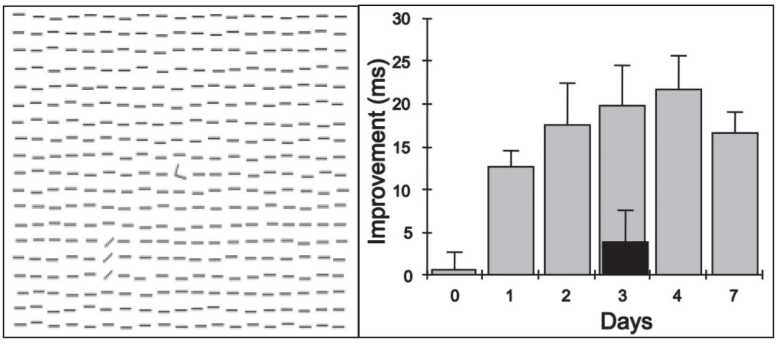

Figure 1. Visual texture discrimination task [3]. (LEFT) Subjects view stimuli similar to those on the left, with a T or L at a central fixation point and 3 diagonal bars arranged in a vertical column, as shown here, or a horizontal row, against a background of horizontal bars. Stimuli are displayed for 17ms followed, after a variable interstimulus interval (ISI), by a mask. (RIGHT) Threshold is defined as the interpolated ISI at which subjects attain 80% accuracy in reporting the orientation of the diagonal bar array, and improvement is defined as the decrease in threshold between the training and retest sessions. Gray bars: improvement when retested on the same day as training (Days=0) or after 1-7 nights of sleep. Each bar represents a separate group, and each group has only one training and one test session. Black bar: improvement after 3 nights when subjects were sleep-deprived the first night after training. Error bars: s.e.m.

Surprisingly, improvement continues over several nights, even in the absence of additional training following the first session. The sleep-dependency of this effect is seen when subjects are sleep deprived the night after training. Even after two nights of recovery sleep, no significant post-learning improvement is seen (Fig 1, right, black bar)[3].

Since learning of this task is retinotopically specific and monocular[17], the learning must be occurring in primary visual cortex (V1), as this is the only brain region that retains monocular information. Therefore, since the sleep-dependent enhancement of this task is also monocular[18], the sleep-dependent processing most likely represents a very basic, synaptic level

strengthening of the neurons in a restricted region of V1 that respond to visual edges at a specific orientation. Such *synaptic-level* consolidation could result simply from the reactivation of the neural circuits that generate edge-detecting neurons in V1.

Support for this mechanism comes from studies performed in cats, demonstrating that the functional connectivity of neurons in V1 can be modified by 6 hrs of monocular visual exposure, and that this modification can then be enhanced by subsequent sleep[7]. But this simple, straightforward enhancement of visual texture discrimination is far from all that sleep does.

In 2004, Wagner *et al*. reported that sleep can facilitate insight. They trained subjects to use a simple two-rule algorithm to solve a class of mathematical problems, and, during training, had them solve 90 of these problems (Fig 2). Unknown to the subjects, there was a simpler method of solving the problems, requiring only one quarter the time. The simpler method was sufficiently subtle that only a few subjects (7.5%) discovered it during training.

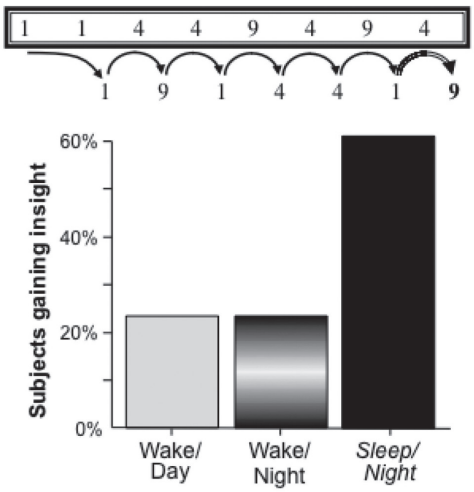

Figure 2. Number reduction task [2]. (TOP) Each trial begins with the display of 8 digits, limited to 1, 4, and 9's. Subjects are taught to process the digits sequentially, producing intermediate answers, before arriving at a final answer, in this case the digit 9. Unknown to the subjects, the last 3 intermediate answers (4-1-9) are always a mirror image of the 3 before (9-1-4), so that the second intermediate answer is always the same as the final answer. (BOTTOM) Percent of subjects in each group who discover the shortcut at retest.

Subjects were either trained in the morning and tested 12 hr later that evening, with no intervening sleep, or were trained in the evening and tested 12 hr later the next morning, after a night of sleep or, for a separate group, after a night of sleep deprivation. During the second session, 23% of subjects who had spent the intervening time awake discovered the shortcut, with the same percentage in both the daytime wake and overnight sleep deprivation groups. But more than twice as many of the subjects who obtained a night of sleep between training and test (59%) discovered the pattern (Fig 2, bottom).

The ability to discover such insights represents a level of cognitive processing as complex and sophisticated as the visual discrimination task, described above, is simple and straightforward. Between them, these tasks suggest the enormous breadth of memory evolution that occurs during sleep.

Memory replay during dreaming

One of the obvious questions that arise concerning sleep-dependent memory processing is what role, if any, dreaming plays in this process. While dreams have been generally accept to reflect some form of memory processing at least since the time of Freud [19], scientific evidence has been generally lacking. Even solid evidence of the incorporation of waking memories into dream content has been difficult to come by. While there is considerable evidence, dating back to the time of Freud, that events of the day are incorporated into dream content, one more recent study found that only 1-2% of dreamer-identified incorporations bore sufficient similarity to the identified waking memory to suggest anything like veridical incorporation of a waking episodic memory into dream content [20]. Instead, in the vast bulk of such dreamer-identified incorporations, the similarities to the waking event tended to be similarities of emotional tone or of general thematic content. Historically, attempts to experimentally induce the incorporation of waking experiences into dreams through the use of prurient or horrific video footage have been largely unsuccessful.

More recently, such incorporation has been achieved, by using engaging learning tasks, such as the classic computer game Tetris [21] or the video arcade game Alpine Racer [22], and focusing on reports collected from the sleep onset period. Almost half of all reports collected the night

after subjects first trained on Alpine Racer were tasked related, and 75% of these were directly related to the task, either referring specifically to playing Alpine Racer or describing skiing scenes more generally [22]. But these studies offered no evidence that dreaming about the learning tasks enhanced subsequent performance. This negative result was not surprising, as the game-to-game variability in performance would have required an unreasonably large effect size for such performance gains to have even come close to showing significance. Nevertheless, these studies did define a paradigm within which such correlations could be more appropriately sought.

More recently, we have developed a 3-dimensional virtual maze task specifically to investigate the relationship of dream incorporation to sleep-dependent memory processing [23,24]. In our first study, subjects were trained at noon on the maze (Fig 3, left) and tested at 5PM, after either a period of wake or a period containing a 90-min nap opportunity. While subjects who remained awake between training and retest took about a minute longer to navigate the maze at retest (compared to the end of training), subjects who napped completed it about a minute faster (Fig 3, right) [25]. Thus, as with the visual texture discrimination and mathematical insight studies described above, a period of sleep led to enhanced task performance.

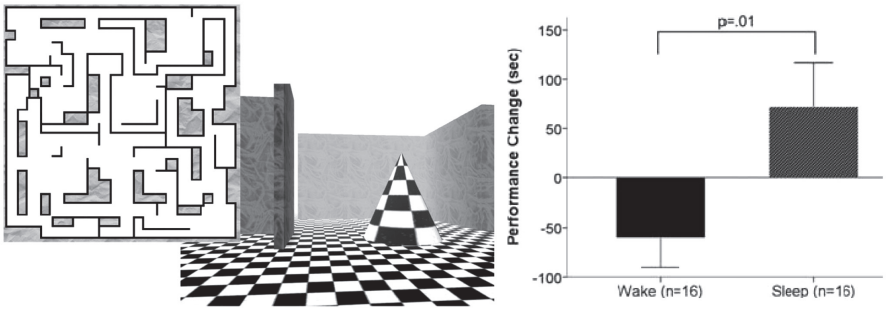

Figure 3. Virtual maze task [22]. (LEFT) An aerial view of maze, which is never seen by subjects, and a sample screen shot of the 3D perspective seen by subjects from within the maze. (RIGHT) Decrease in mean time required to navigate from 3 starting points to the maze exit at retest, compared to time on last training trial. Positive values reflect improved performance. Error bars = s.e.m.

This protocol was repeated in a second study [24], with the addition of the active collection of dream reports during the nap and wake mentation reports at the same times from those subjects in the Wake control group. Reports with clear reference to the maze task were obtained from both Wake and Nap subjects. In the Wake subjects, the presence of absence of such thoughts had no significant impact on their subsequent task performance (Fig 4, "Wake"). In contrast, for the Nap group, all of the group improvement was found in those subjects reporting dreams about the task (Fig 4, "Sleep"). Thus, reporting a dream about the task accurately predicted subsequent task improvement, and significantly more improvement than seen either in the subjects who reported no related dreams, or in the Wake group, whether taken as a whole or separated into those Wake subjects who did or did not report having been thinking about the task.

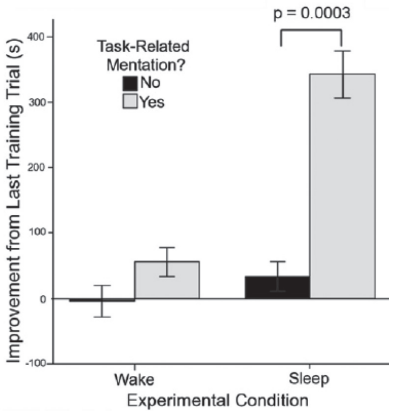

Figure 4. Dreams and virtual maze task [23]. Decrease in mean time required to navigate from 3 starting points to the maze exit at retest, compared to time on last training trial. Positive values reflect improved performance. (LEFT) Subjects in the wake group who either did (gray bar) or did not (black bar) report thoughts or images directly related to the task on at least one of three mentation probes. (RIGHT) Subjects in the nap group who either did (gray bar) or did not (black bar) report thoughts, images, or dreams directly related to the task on at least one of three dream reports elicited from nonREM sleep. Error bars = s.e.m.

Similar findings have been obtained from PET brain imaging studies. Subjects in one study were trained on a 3-D virtual maze, and tested on their memory of the maze after a night of sleep [1]. When PET images were obtained during the night, activity in the hippocampus during slow wave sleep predicted subsequent task improvement (Fig 5). Thus, increased hippocampal activity during sleep, and related dream content during sleep, both predict subsequent improvement in maze task performance. While these findings, taken together, might suggest that the increased hippocampal activity reflected brain activity associated with dreaming about the task, this appears unlikely. First, the increased hippocampal activity was observed during deep, slow wave sleep (SWS), a period of the night when dream recall is notoriously poor. In contrast, the dream reports related to the task were obtained primarily from stage 1 nonREM sleep, the lightest period of sleep of the night. In addition, as noted above, dreams rarely show the type of episodic replay of recent events that would be expected from hippocampal involvement [20]. But more importantly, the hypothesis that the task-related dream content reflected specific brain activity leading to enhanced performance lacks face validity.

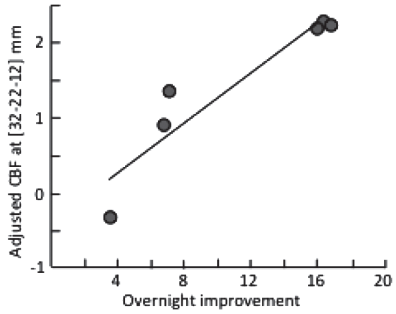

Figure 5. fMRI and virtual maze task [1]. Correlation between overnight improvement of a 3D virtual maze task (decreased distance to maze exit at end of test period) and hippocampal activation during SWS.

While brain imaging studies have obvious advantages over studies relying on dream reports in terms of the reliability and objectivity of the data collected, dream reports nonetheless offer an unparalleled advantage. Correlations between regional brain activity, in this case in the hippocampus, and subsequent improvement in task performance do not make clear what events within the hippocampus form the basis of this correlation. There is, for example, no actual evidence that memories of the task were being reactivated during sleep [26] or, alternatively, that synapses were being generally downscaled [27] – two disparate models of sleep-dependent memory consolidation. The correlation may simply indicate that individual's with more hippocampal activity in general during SWS show more sleep-dependent consolidation, for reasons unrelated to their learning of the particular task.

In contrast, the use of dream reports makes clear that memories strongly associated with the task were, indeed, being reactivated during sleep (Table 1). Mental imagery, both visual and auditory, was reported from the sleep period that was transparently related to the task itself. Interestingly, while prior studies using the video games *Tetris* [21] and *Alpine Racer* [22] produced dream reports that reproduced actual visual imagery from the tasks (e.g., "just seeing Tetris shapes floating around in my head like they would in the game, falling down, sort of putting them together in my mind" [21], or "I once again, saw the, the game, it was smooth at first, and then it went into the cave" [22]), the images in the maze task seem more associative in nature.

Table 1. Task-related dream mentation [24]. Subjects were asked to report "everything that was going through your mind" immediately prior to experimental awakenings. Awakenings were performed just prior to the initiation of sleep, after 1min of continuous sleep ("sleep onset" reports), and at the termination of the nap period. Reports listed here were obtained after 1 min of sleep or at the end of the nap.

Nap-114	Sleep onset	"I was thinking about the maze and kinda having people as check points, I guess, and then that led me to think about when I went on this trip few years ago and we went to see these bat caves, and they're kind of like, maze-like"
Nap-230	Stage 2 NREM	"looking for something" in a maze.
Nap-247	Sleep onset	hearing music from maze task
Nap-251	Sleep onset	hearing music from maze task

More importantly, the content of the dream reports, while clearly indicating reactivation of memories associated with the task, clearly does not indicate reactivation of memories of the layout of the maze or of any other aspects of the task that would reasonably lead to better performance. In fact, it is the task-related recall of wake subjects that arguably should lead to better performance. For example, one wake subject reported, "thinking about the game that I used to play in high school, 'Counter-Strike', because of the same layout … and also I was just planning, and trying to remember the maze and trying to figure out the route," while another reported "thinking [about] what we have to do in the second maze test … wondered if it was going to be, like, the same …" But despite the apparent utility of such thoughts, wake subjects who reported such related thoughts failed to show significant improvement, or significantly more improvement than other wake subjects who reported no task-related thoughts (Fig 4, "Wake").

The Whole-Braining Processing model

How do we explain the apparent contradiction between virtual maze-related dream content predicting subsequent task improvement [23] and the lack of face validity for the argument that the dreams reflect the brain processes which lead to task improvement? Similarly, how do we explain the strong correlation between virtual maze task improvement and hippocampal activation [1], when hippocampally mediated episodic memory recall does not contribute to dream content [20]? One explanation is the Whole-Brain Processing model of sleep-dependent memory evolution (Table 2).

Table 2. Whole-Brain Processing. Simultaneous sleep-dependent processing of task memories across cognitive systems results in a wide range of memory products, ranging from synaptic level stabilization and enhancement to the systems-level development of imagined scenarios incorporating aspects of the task as well as associated, older, related memories, and the experiencing of these scenarios as dreams.

Sleep-Dependent Memory Processing:
A Whole-Brain Process

Hippocampus ⇒	• Stabilization and enhancement
Neocortex	• Salience selection • Rule and gist extraction • Network integration
Dreaming	• Narrative development • Imagined scenarios • Theory of mind

This model hypothesizes that multiple cognitive systems are engaged simultaneously in the processing of recent memories during sleep. In the case of our virtual maze task, the model suggests that processing in the hippocampus, which is known to reactivate maps of spatial information across hippocampal place cells during sleep [28], and which is correlated with sleep-dependent task improvement [1], leads to the basic consolidation and enhancement of these spatial maps that results in the improved performance seen post-sleep.

At the same time, neocortical structures that are known to support the sleep-dependent processing of recently encoded memories identify and selectively retain the most salient information encoded during the previous day [14], extract rules and gist descriptions of larger sets of encoded information [15,16,29], and integrate new information into existing neural networks of associated memories [13]. In the case of our virtual maze task, this could include selectively enhancing information about the task, extracting the overall spatial map from multiple trials starting at different points in the maze, or integrating information about the task with memories of similar computer games or other prior experiences (*e.g.*, exploring bat caves).

Finally, dream construction, which is known to involve narrative development of imagined scenarios occurs in parallel with these multiple

forms of memory processing. Indeed, dreaming may simply reflect conscious awareness of this processing. Insofar as memory is seen as being primarily for facilitating future actions, rather than for reminiscing about the past [30,31], the construction of imagined future scenarios becomes a valuable potential mechanism of memory evolution during sleep, and may explain the function of those brain processes that lead to dreaming [23].

Thus, dreaming about the virtual maze task may not, itself, contribute to subsequent task improvement. Instead, it reflects the Whole-Brain Processing of the recently formed memories of the task, informing the dreamer that such processing, including components that do, indeed, lead to improved task performance, are taking place.

Acknowledgements

This work was supported by NIH grants MH48832 and MH92638, and by a Tom Slick Research Award from the Mind Science Foundation.

Citations

1. Peigneux, P. *et al*. Are spatial memories strengthened in the human hippocampus during slow wave sleep? *Neuron* 44, 535-545 (2004).

2.Wagner, U., Gais, S., Haider, H., Verleger, R. & Born, J. Sleep inspires insight. *Nature* 427, 352-355 (2004).

3. Stickgold, R., James, L. & Hobson, J. A. Visual discrimination learning requires sleep after training. *Nat Neurosci* 3, 1237-1238 (2000).

4. Li, X., Yu, F. & Guo, A. Sleep deprivation specifically impairs short-term olfactory memory in Drosophila. *Sleep* 32, 1417-1424 (2009).

5. Shank, S. S. & Margoliash, D. Sleep and sensorimotor integration during early vocal learning in a songbird. *Nature* 458, 73-77 (2009).

6. Smith, C. T., Conway, J. M. & Rose, G. M. Brief paradoxical sleep deprivation impairs reference, but not working, memory in the radial arm maze task. *Neurobiol. Learn. Mem*. 69, 211-217 (1998).

7. Frank, M. G., Issa, N. P. & Stryker, M. P. Sleep enhances plasticity in the developing visual cortex. *Neuron* 30, 275-287 (2001).

8. Walker, M. P. & Stickgold, R. Sleep, memory, and plasticity. *Annual Reviews* in *Psychology* 57, 139-166 (2006).

9.Müller, G. E. & Pilzecker, A. Experimentelle Beitrage zur Lehre vom Gedachtniss. *Zeitschrift fuer Psychologie* 1, 1-288 (1900).

10. Dudai, Y. The neurobiology of consolidations, or, how stable is the engram? *Annu Rev Psychol* 55, 51-86 (2004).

11. Ellenbogen, J. M., Hulbert, J. C., Stickgold, R., Dinges, D. F. & Thompson-Schill, S. L. Interfering with theories of sleep and memory: sleep, declarative memory, and associative interference. *Curr. Biol*. 16, 1290-1294 (2006).

12. Karni, A., Tanne, D., Rubenstein, B. S., Askenasy, J. J. & Sagi, D. Dependence on REM sleep of overnight improvement of a perceptual skill. *Science* 265, 679-682 (1994).

13. Tamminen, J., Payne, J. D., Stickgold, R., Wamsley, E. J. & Gaskell, M. G. Sleep spindle activity is associated with the integration of new memories and existing knowledge. *J Neurosci* 30, 14356-14360 (2010).

14. Payne, J. D., Stickgold, R., Swanberg, K. & Kensinger, E. A. Sleep preferentially enhances memory for emotional components of scenes. *Psychol. Sci*. 19, 781-788 (2008).

15. Payne, J. D. *et al*. The role of sleep in false memory formation. *Neurobiol Learn Mem* 92, 327-334 (2009).

16. Djonlagic, I. *et al*. Sleep enhances category learning. *Learn. Mem*. 16, 751-755 (2009).

17. Karni, A. & Sagi, D. Where practice makes perfect in texture discrimination: evidence for primary visual cortex plasticity. *Proc. Natl. Acad. Sci. U.S.A.* 88, 4966-4970 (1991).

18. Walker, M. P., Liston, C., Hobson, J. A. & Stickgold, R. S. Cognitive flexibility across the sleep-wake cycle: REM-sleep enhancement of anagram problem solving. *Cognitive Brain Research* 14, 317-324 (2002).

19. Freud, S. *The Interpretation of Dreams*. (Random House, 1900).

20. Fosse, M. J., Fosse, R., Hobson, J. A. & Stickgold, R. J. Dreaming and episodic memory: a functional dissociation? *J Cogn Neurosci* 15, 1-9 (2003).

21. Stickgold, R., Malia, A., Maguire, D., Roddenberry, D. & O'Connor, M. Replaying the game: hypnagogic images in normals and amnesics. *Science* 290, 350-353 (2000).

22. Wamsley, E. J., Perry, K., Djonlagic, I., Reaven, L. B. & Stickgold, R. Cognitive replay of visuomotor learning at sleep onset: temporal dynamics and relationship to task performance. *Sleep* 33, 59-68 (2010).

23. Wamsley, E. J. & Stickgold, R. Dreaming and offline memory processing. *Curr Biol* 20, R1010-1013 (2010).

24.Wamsley, E. J., Tucker, M., Payne, J. D., Benavides, J. A. & Stickgold, R. Dreaming of a learning task is associated with enhanced sleep-dependent memory consolidation. *Curr Biol* 20, 850-855 (2010).

25. Wamsley, E. J., Tucker, M. A., Payne, J. D. & Stickgold, R. A brief nap is beneficial for human route-learning: The role of navigation experience and EEG spectral power. *Learn. Mem*. 17, 332-336 (2010).

26. Rasch, B. & Born, J. Maintaining memories by reactivation. *Curr Opin Neurobiol* 17, 698-703 (2007).

27. Tononi, G. & Cirelli, C. Sleep function and synaptic homeostasis. *Sleep Med. Rev*. 10, 49-62 (2006).

28. Wilson, M. A. & McNaughton, B. L. Reactivation of hippocampal ensemble memories during sleep. *Science* 265, 676-679 (1994).

29. Ellenbogen, J. M., Hu, P. T., Payne, J. D., Titone, D. & Walker, M. P. Human relational memory requires time and sleep. *Proc. Natl. Acad. Sci. U.S.A*. 104, 7723-7728 (2007).

30. Addis, D. R., Wong, A. T. & Schacter, D. L. Remembering the past and imagining the future: common and distinct neural substrates during event construction and elaboration. *Neuropsychologia* 45, 1363-1377 (2007).

31. Addis, D. R., Sacchetti, D. C., Ally, B. A., Budson, A. E. & Schacter, D. L. Episodic simulation of future events is impaired in mild Alzheimer's disease. *Neuropsychologia* 47, 2660-2671 (2009).

DREAMS, EMOTIONS AND BRAIN PLASTICITY

Sophie Schwartz [*]

1. Introduction

"*The scariest place was a neighborhood with sinuous paths. I was worried. Leaving the neighborhood, I saw a lot of lizards. I was looking for my girlfriend but could never find her. Sometimes, I was completely lost. At some point, shots were fired in my direction but I do not know if I was touched. The dream was very unpleasant. I was not comfortable.*"

This dream report was written by a young man just after waking up. It reveals several typical features of dream experiences such as complex perceptions (seeing places and animals), spatial navigation (moving from one place to the other), intentions or goals (looking for someone), confusion or amnesia (uncertain about being wounded), as well as particularly intense emotions, including high anxiety. One simple question that I would like to discuss here is why strong emotional experiences are so common in dreams. I will review psychological and neurophysiological data indicating that affective and motivational processes as well as underlying dedicated brain circuits are activated during sleep. I will also suggest that information that is highly relevant for the individual is prioritized for reprocessing during sleep. Moreover, emotions that we experience in dreams may subsequently promote adapted waking emotional reactivity and decision making [1, 2]. More generally, in the present paper, I provide support for the hypothesis that emotional or motivation factors exert a continuous influence on mental and neural activity across distinct brain states. Such affective effects during both wakefulness and sleep would thus guide (or bias) the selection of information that will gain access to conscious representation.

While we dream, the brain is not at rest. This is evidenced by measures of brain activity acquired during sleep using various techniques such as for

[*] Faculty of Medicine, University of Geneva, Switzerland.

example electroencephalography (EEG), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI). During rapid-eye movement (REM) sleep, brain activity measured by EEG resembles that observed during resting wakefulness. Moreover, during REM sleep, the virtual world that we experience in dreams is perceptually very veridical. Yet, dream experiences are no replicates of real life experiences: objects or characters that populate the dreams may often seem familiar although they differ from their real-life equivalents; perceptual representations are often bizarre, with distortions of size, texture, or color, for example; upon awakening, the dream plot may appear rather illogical; the dreamer is usually unaware of being in a dream; etc. Related to our initial question and as illustrated in the dream reported above, another key feature in dream reports is the high prevalence of strong emotions (especially for REM dreams) [3, 4], more negatively-loaded than those experienced in real life, and frequently related to fear or anxiety.

How to can we relate the content of the dreams with underlying neural activity during sleep? The specific pattern of regions activated during REM sleep in humans is consistent with some main features of dreaming experience [1, 5-9] (Figure 1). In particular, widespread activity along occipital-temporal visual regions and motor regions is consistent with the highly visual and motor content of the dreams. Conversely, hypoactivation of lateral prefrontal cortices during REM sleep may cause disorientation, illogical thinking, and prevent supervisory control functions so that bizarre elements in dreams are not recognized as incompatible with our conception of the real world and of ourselves. Concerning strong (particularly negative) emotions in dreams, they may be facilitated by a net increase in amygdala activity, in particular during REM sleep [9]. Finally, we also recently proposed that the activation of the hippocampus and mesolimbic dopaminergic system (ML-DA) reward system (including the medial prefrontal cortex and in the dopaminergic ventral tegmental area) during sleep contributes to memory processes and to the generation and the motivational content of dreams [5]. Accordingly, the engagement of ML-DA and associated limbic structures would prioritize information with high emotional or motivational relevance for (re)processing during sleep and dreaming.

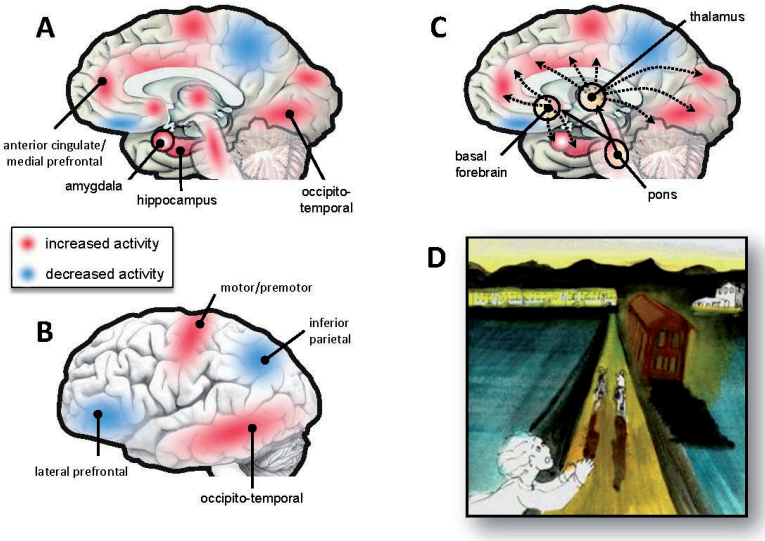

Figure 1. Distribution of activity in REM sleep and typical dream features. Regions showing increased or decreased brain activity in human brain imaging studies: (A) lateral view of the brain and (B) medial view. (B) Internally-generated activation during REM sleep: activation waves originating from the pontine tegmentum generate widespread cortical activation via the thalamus and the basal forebrain. (C) Illustration of a dream involving strong fear-related emotions: terrified by some danger (not shown), the dreamer runs away from it hoping to catch the yellow train at the end of the road. Such frightening experiences in dreams are evocative of increased amygdala activation during REM sleep. The drawing comes from a dream diary extensively analyzed elsewhere (S. Schwartz, Doctoral thesis).

Below I first review some recent research on the role of sleep in memory functions, with a special emphasis on brain imaging studies in humans. I then report convergent clinical, neuroimaging, and dream data showing that sleep and emotion interact to optimize daytime functioning.

2. Sleep and memory processes

While waking brain function is critical to cognition, sleep contributes to equally essential and complementary operations. In particular, evidence has accumulated to show that sleep is implicated in the active

consolidation of memory [10, 11]. Strong support for the role of sleep in memory comes from the observation that patterns of neuronal activity associated with a recently-trained waking behavior may be spontaneous replayed during later periods of sleep (or quiet wakefulness) [12-17]. In animals, this replay can be found across several brain areas (e.g. hippocampus, ventral striatum, and neocortex) and directly contributes to learning processes through a mechanism of synaptic strengthening. Similarly, human brain imaging data have shown that regions activated during waking experiences are spontaneously reactivated during sleep, leading to long lasting changes in brain activity and connectivity [10, 18-23]. In sum, these recent data suggest that sleep fosters the consolidation of newly acquired information in memory [24].

Yet, the factors influencing the selection of freshly encoded information for further consolidation during sleep remain largely unknown. Here, I hypothesize that our brains prioritize information with high emotional relevance in the competition for subsequent reprocessing during sleep.

3. Sleep and emotional processing

Insufficient sleep and sleep disorders are typically accompanied by daytime complaints, several of them suggesting some form of emotional dysregulation [25-27]. Similarly, narcolepsy with cataplexy (NC), which is a major sleep disorder due to a deficiency in hypocretin/orexin (HCRT), presents with a striking emotional component: cataplexy (sudden loss of muscle tone) in NC is triggered by emotions, most often by laughing, joking, playing games [28-30]. In our functional magnetic resonance imaging (fMRI) studies on NC, we showed increased amygdala response to emotionally-positive situation, i.e. watching humorous pictures and winning at games [31, 32]. We also found altered responses in mesolimbic reward circuits and medial prefrontal cortex (mPFC), supporting a link between the HCRT system and the expression of motivated behaviors and addiction [33], and consistent with the fact that HCRT-deficient NC patients rarely become addicted to highly-addictive treatments. In addition, we demonstrated impaired emotional learning in NC patients, expressed by the lack of amygdala modulation by conditioned stimuli, and an abnormal functional coupling between the amygdala and mPFC

[34]. Altogether, these findings suggest that the processing of emotional signals engages neurotransmitters and neural pathways that are also critically involved in the maintenance of sleep-wake states.

3.1. Sleep alterations in emotion disorders

The vast majority of psychiatric disorders, especially those involving emotional dysregulation, are associated with sleep abnormalities [27]. Post-traumatic stress disorder (PTSD) is an important psychiatric condition with major sleep disturbances, characterized by frequent nightmares and insomnia due to recurrent, unwanted re-experiencing of the traumatic event [35, 36]. Moreover, insomnia and REM sleep alterations in the acute aftermath of trauma (including increased amygdala activity) could relate to the subsequent development of PTSD [37-39].

3.2. Effects of sleep deprivation on emotional and reward processing

Reduced emotional control is frequently observed after sleep-deprivation in the form of irritability, impulsivity, childish humor, disregard of normal social conventions, and inappropriate interpersonal behaviors [40, 41]. Emotional processing might actually be more affected by sleep deprivation than cognitive or motor performance [42, 43]. For example, insufficient sleep is associated with changes in reward-related decision making: people take greater risks [41, 44], are less concerned with negative consequences [45-47], and overestimate positive emotional experiences [48]. In 2009, Holm et al. showed that in both reward anticipation and outcome phases of a card-game, adolescents with fewer minutes asleep and later sleep onset time exhibited less caudate activation [49], a structure implicated in linking reward to behavior and learning [50]. Collectively, these recent data suggest that less sleep may impact on neural systems involved in emotional and reward processing in ways that exacerbate behavioral problems (e.g. increased risk-taking), and may thus have major health implications in both adolescents and adults.

3.3 Consolidation of emotional memory during sleep

Behavioral studies suggest that REM sleep enhances the consolidation of enduring emotional memories [38, 51] or emotional components of scenes [52]. Very few studies have started to reveal the cerebral mechanisms underlying sleep-related emotional memory consolidation. Using fMRI, Sterpenich et al. showed that sleep during the first post-encoding night critically enhances the long-term consolidation of emotional memory by modulating amygdala-mPFC functional connections [20, 21]. These data support our proposal that emotional significance may boost sleep-related memory consolidation. Whether dreaming plays an active role in memory consolidation was investigated by Bob Stickgold and his collaborator Erin Wamsley [53, 54] who elegantly showed that dreaming about elements of a recently trained task led to an improvement in performance for this task, when compared to subjects who did not report dream content related to the task. This observation is also consistent with the idea that dreams are influenced by waking emotional concerns of the sleeper [36, 55-57].

4. Emotions in dreams

Dream research has brought support to the traditional belief that dreams are highly emotional: dream reports contain a high proportion of fear- or anxiety-related emotions (compared to real-life emotion spectrum) [4]. An elevated intensity of emotions in dreams might relate to high amygdala activity during REM sleep, since the amygdala responds to emotional stimuli, stressful situations, and novelty [6, 9]. It has been proposed that normal dreaming could allow an adaptive extinction of fear memories by activating some features of those memories without their pairing with the unpleasant unconditioned stimulus [35, 36]. The suggested cathartic function of dreaming might also be mediated by the persistence of activity in mPFC cortex during REM sleep [9, 58], a region (particularly its ventral part) that is known to send inhibitory feedbacks to the amygdala. While mental health depends on the successful extinction of the terror associated with traumatic memories, it may be equally essential for the individual's survival to maintain memories for

life-threatening information. In this respect, PTSD might be seen as an undesirable consequence of a useful threat-detection neural apparatus. Consistent with this interpretation, Revonsuo and Valli recently proposed that dreaming might serve to simulate responses to threatening events in a totally secure environment, and ultimately promote adapted and efficient reactions to dangerous real-life events [4, 59]. Accordingly, dreams may serve important biological and psychological functions [60, 61].

In a recent proposal, we extended this view by suggesting that activation of the ML-DA reward system during sleep creates an internal environment of high exploratory excitability and elevated novelty-seeking [5]. Sustained activation of the ML-DA reward system (in particular the VTA) during REM sleep [62-65] may thus favor the activation of stimulus representations or behaviors of high motivational relevance, which would induce approach and avoidance behaviors. For example, pleasant and positive content of a dream (e.g. winning a game or having sex) would constitute a rewarding (approach-prone) stimulus, whereas threat-related content (e.g. being chased or attacked) would be an aversive (avoidance-prone) stimulus. NAcc and VTA may actually be activated independently of the emotional valence of the dream content, because both structures are found to be activated during both reward and punisher anticipation [66, 67]. Motivational and emotional content may be more prominent in REM than in NREM dreaming [3]. This is consistent with the finding that several limbic and ML-DA regions are selectively activated during REM, with amygdala activity and burst firing in the VTA being significantly higher in REM compared to NREM. Importantly, because dreams offer a virtual reality platform for an acquaintance of the dreamer with diverse stimuli, including stimuli of high emotional and/or motivational value from the recent past, activation of the ML-DA reward system during sleep and dreaming may contribute to adaptive memory processes, leading to subsequent performance improvement during wakefulness.

5. Conclusions

The main aim of this review was to demonstrate that sleep and dreaming, in particular emotions in dreams, serve vital functions by fostering adapted reactions to potential psychological (and physical)

threats (or rewards), and can thus jointly contribute to the optimization of waking functioning. Accordingly, emotional relevance would guide the selection of information to be further processed and consolidated in memory, yielding a continuous remodeling of memory networks and reshaping of future goals and behaviors. This emerging view is based on the integration of data generated at different levels of organization, from the basic neurobiology of reward and sleep to affective and cognitive levels encompassing dreaming and consciousness in humans. Such an integrated framework for the study of human sleep and dreaming is particularly necessary to accommodate the diversity and increasing sophistication of modern neuroimaging research. Actually, a fundamental objective for future studies will be to systematically investigate changes in brain activity and mental content across all sleep-wake states, and thus obtain a detailed characterization of the neural determinants of human conscious experience. These studies will be especially important because sleep curtailment emerges as a major health problem, with disastrous socioeconomic and public safety consequences. Thus, providing scientific evidence that sleep affects learning and emotion regulation is highly valuable to promote measures to prevent sleep restriction and its consequences, particularly in the most vulnerable populations, such as for example psychiatric patients or children.

Acknowledgments

This work is supported by the Swiss National Science Foundation and the Pierre Mercier Foundation.

References

1. Desseilles, M., Dang-Vu, T.T., Sterpenich, V., and Schwartz, S. (2011). Cognitive and emotional processes during dreaming: a neuroimaging view. Conscious Cogn 20, 998-1008.

2. Walker, M.P., and van der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. Psychol Bull 135, 731-748.

3. Smith, M.R., Antrobus, J.S., Gordon, E., Tucker, M.A., Hirota, Y., Wamsley, E.J., Ross, L., Doan, T., Chaklader, A., and Emery, R.N. (2004). Motivation and affect in REM sleep and the mentation reporting process. Conscious Cogn 13, 501-511.

4. Valli, K., and Revonsuo, A. (2009). The threat simulation theory in light of recent empirical evidence: a review. Am J Psychol 122, 17-38.

5. Perogamvros, L., and Schwartz, S. (2012). The roles of the reward system in sleep and dreaming. Neurosci Biobehav Rev 36, 1934-1951.

6. Schwartz, S., and Maquet, P. (2002). Sleep imaging and the neuro-psychological assessment of dreams. Trends Cogn Sci 6, 23-30.

7. Hobson, J.A., Pace-Schott, E.F., Stickgold, R., and Kahn, D. (1998). To dream or not to dream? Relevant data from new neuroimaging and electrophysiological studies. Curr Opin Neurobiol 8, 239-244.

8. Schwartz, S. (2004). What dreaming can reveal about cognitive and brain functions during sleep: A lexico-statistical analysis of dream reports. Psychological Belgica 44, 5-42.

9. Maquet, P., Peters, J., Aerts, J., Delfiore, G., Degueldre, C., Luxen, A., and Franck, G. (1996). Functional neuroanatomy of human rapid-eye-movement sleep and dreaming. Nature 383, 163-166.

10. Rasch, B., and Born, J. (2007). Maintaining memories by reactivation. Curr Opin Neurobiol 17, 698-703.

11. Maquet, P. (2001). The role of sleep in learning and memory. Science 294, 1048-1052.

12. Wilson, M.A., and McNaughton, B.L. (1994). Reactivation of hippocampal ensemble memories during sleep. Science 265, 676-679.

13. Euston, D.R., Tatsuno, M., and McNaughton, B.L. (2007). Fast-forward playback of recent memory sequences in prefrontal cortex during sleep. Science 318, 1147-1150.

14. Pennartz, C.M., Lee, E., Verheul, J., Lipa, P., Barnes, C.A., and McNaughton, B.L. (2004). The ventral striatum in off-line processing: ensemble reactivation during sleep and modulation by hippocampal ripples. J Neurosci 24, 6446-6456.

15. Peyrache, A., Khamassi, M., Benchenane, K., Wiener, S.I., and Battaglia, F.P. (2009). Replay of rule-learning related neural patterns in the prefrontal cortex during sleep. Nat Neurosci 12, 919-926.

16. Lansink, C.S., Goltstein, P.M., Lankelma, J.V., McNaughton, B.L., and Pennartz, C.M. (2009). Hippocampus leads ventral striatum in replay of place-reward information. PLoS Biol 7, e1000173.

17. Lansink, C.S., Goltstein, P.M., Lankelma, J.V., Joosten, R.N., McNaughton, B.L., and Pennartz, C.M. (2008). Preferential reactivation of motivationally relevant information in the ventral striatum. J Neurosci 28, 6372-6382.

18. Peigneux, P., Laureys, S., Fuchs, S., Collette, F., Perrin, F., Reggers, J., Phillips, C., Degueldre, C., Del Fiore, G., Aerts, J., et al. (2004). Are spatial memories strengthened in the human hippocampus during slow wave sleep? Neuron 44, 535-545.

19. Maquet, P., Laureys, S., Peigneux, P., Fuchs, S., Petiau, C., Phillips, C., Aerts,

J., Del Fiore, G., Degueldre, C., Meulemans, T., et al. (2000). Experience-dependent changes in cerebral activation during human REM sleep. Nat Neurosci 3, 831-836.

20. Sterpenich, V., Albouy, G., Darsaud, A., Schmidt, C., Vandewalle, G., Dang Vu, T.T., Desseilles, M., Phillips, C., Degueldre, C., Balteau, E., et al. (2009). Sleep promotes the neural reorganization of remote emotional memory. J Neurosci 29, 5143-5152.

21. Sterpenich, V., Albouy, G., Boly, M., Vandewalle, G., Darsaud, A., Balteau, E., Dang-Vu, T.T., Desseilles, M., D'Argembeau, A., Gais, S., et al. (2007). Sleep-related hippocampo-cortical interplay during emotional memory recollection. PLoS Biol 5, e 282.

22. Maquet, P., Schwartz, S., Passingham, R., and Frith, C. (2003). Sleep-related consolidation of a visuomotor skill: brain mechanisms as assessed by functional magnetic resonance imaging. J Neurosci 23, 1432-1440.

23. Schwartz, S., Maquet, P., and Frith, C. (2002). Neural correlates of perceptual learning: a functional MRI study of visual texture discrimination. Proc Natl Acad Sci U S A 99, 17137-17142.

24. Diekelmann, S., and Born, J. (2010). The memory function of sleep. Nat Rev Neurosci 11, 114-126.

25. Waters, W.F., Adams, S.G., Jr., Binks, P., and Varnado, P. (1993). Attention, stress and negative emotion in persistent sleep-onset and sleep-maintenance insomnia. Sleep 16, 128-136.

26. Schmidt, R.E., and Van der Linden, M. (2009). The aftermath of rash action: sleep-interfering counterfactual thoughts and emotions. Emotion 9, 549-553.

27. Benca, R.M., Obermeyer, W.H., Thisted, R.A., and Gillin, J.C. (1992). Sleep and psychiatric disorders. A meta-analysis. Arch Gen Psychiatry 49, 651-668; discussion 669-670.

28. Baumann, C.R., and Bassetti, C.L. (2005). Hypocretins (orexins) and sleep-wake disorders. Lancet Neurol 4, 673-682.

29. Dang-Vu, T.T., Desseilles, M., Schwartz, S., and Maquet, P. (2009). Neuroimaging of narcolepsy. CNS Neurol Disord Drug Targets 8, 254-263.

30. Desseilles, M., Dang-Vu, T., Schabus, M., Sterpenich, V., Maquet, P., and Schwartz, S. (2008). Neuroimaging insights into the pathophysiology of sleep disorders. Sleep 31, 777-794.

31. Schwartz, S., Ponz, A., Poryazova, R., Werth, E., Boesiger, P., Khatami, R., and Bassetti, C.L. (2008). Abnormal activity in hypothalamus and amygdala during humour processing in human narcolepsy with cataplexy. Brain 131, 514-522.

32. Ponz, A., Khatami, R., Poryazova, R., Werth, E., Boesiger, P., Bassetti, C.L., and Schwartz, S. (2010). Abnormal activity in reward brain circuits in human narcolepsy with cataplexy. Ann Neurol 67, 190-200.

33. Harris, G.C., and Aston-Jones, G. (2006). Arousal and reward: a dichotomy in orexin function. Trends Neurosci 29, 571-577.

34. Ponz, A., Khatami, R., Poryazova, R., Werth, E., Boesiger, P., Schwartz, S., and Bassetti, C.L. (2010). Reduced amygdala activity during aversive conditioning in human narcolepsy. Ann Neurol 67, 394-398.

35. Levin, R., and Nielsen, T.A. (2007). Disturbed dreaming, posttraumatic stress disorder, and affect distress: a review and neurocognitive model. Psychol Bull 133, 482-528.

36. Nielsen, T., and Levin, R. (2007). Nightmares: a new neurocognitive model. Sleep Med Rev 11, 295-310.

37. Mellman, T.A., Bustamante, V., Fins, A.I., Pigeon, W.R., and Nolan, B. (2002). REM sleep and the early development of posttraumatic stress disorder. Am J Psychiatry 159, 1696-1701.

38. Wagner, U., Hallschmid, M., Rasch, B., and Born, J. (2006). Brief sleep after learning keeps emotional memories alive for years. Biol Psychiatry 60, 788-790.

39. Germain, A., Buysse, D.J., and Nofzinger, E. (2008). Sleep-specific mechanisms underlying posttraumatic stress disorder: integrative review and neurobiological hypotheses. Sleep Med Rev 12, 185-195.

40. Horne, J.A. (1993). Human sleep, sleep loss and behaviour. Implications for the prefrontal cortex and psychiatric disorder. Br J Psychiatry 162, 413-419.

41. Harrison, Y., and Horne, J.A. (2000). The impact of sleep deprivation on decision making: a review. J Exp Psychol Appl 6, 236-249.

42. Dinges, D.F., Pack, F., Williams, K., Gillen, K.A., Powell, J.W., Ott, G.E., Aptowicz, C., and Pack, A.I. (1997). Cumulative sleepiness, mood disturbance, and psychomotor vigilance performance decrements during a week of sleep restricted to 4-5 hours per night. Sleep 20, 267-277.

43. Yoo, S.S., Gujar, N., Hu, P., Jolesz, F.A., and Walker, M.P. (2007). The human emotional brain without sleep--a prefrontal amygdala disconnect. Curr Biol 17, R877-878.

44. McKenna, B.S., Dickinson, D.L., Orff, H.J., and Drummond, S.P. (2007). The effects of one night of sleep deprivation on known-risk and ambiguous-risk decisions. J Sleep Res 16, 245-252.

45. Venkatraman, V., Huettel, S.A., Chuah, L.Y., Payne, J.W., and Chee, M.W. (2011). Sleep deprivation biases the neural mechanisms underlying economic preferences. J Neurosci 31, 3712-3718.

46. Venkatraman, V., Chuah, Y.M., Huettel, S.A., and Chee, M.W. (2007). Sleep deprivation elevates expectation of gains and attenuates response to losses following risky decisions. Sleep 30, 603-609.

47. Chee, M.W., and Chuah, L.Y. (2008). Functional neuroimaging insights into how sleep and sleep deprivation affect memory and cognition. Curr Opin Neurol 21, 417-423.

48. Gujar, N., Yoo, S.S., Hu, P., and Walker, M.P. (2011). Sleep deprivation amplifies reactivity of brain reward networks, biasing the appraisal of positive emotional experiences. J Neurosci 31, 4466-4474.

49. Holm, S.M., Forbes, E.E., Ryan, N.D., Phillips, M.L., Tarr, J.A., and Dahl, R.E. (2009). Reward-related brain function and sleep in pre/early pubertal and mid/late pubertal adolescents. J Adolesc Health 45, 326-334.

50. Haber, S.N., and Knutson, B. (2010). The reward circuit: linking primate anatomy and human imaging. Neuropsychopharmacology 35, 4-26.

51. Wagner, U., Gais, S., and Born, J. (2001). Emotional memory formation is enhanced across sleep intervals with high amounts of rapid eye movement sleep. Learn Mem 8, 112-119.

52. Payne, J.D., Stickgold, R., Swanberg, K., and Kensinger, E.A. (2008). Sleep preferentially enhances memory for emotional components of scenes. Psychol Sci 19, 781-788.

53. Wamsley, E.J., and Stickgold, R. (2010). Dreaming and offline memory processing. Curr Biol 20, R1010-1013.

54. Wamsley, E.J., Tucker, M., Payne, J.D., Benavides, J.A., and Stickgold, R. (2010). Dreaming of a learning task is associated with enhanced sleep-dependent memory consolidation. Curr Biol 20, 850-855.

55. Mancia, M. (2004). The dream between neuroscience and psychoanalysis. Arch Ital Biol 142, 525-531.

56. Cartwright, R., Agargun, M.Y., Kirkby, J., and Friedman, J.K. (2006). Relation of dreams to waking concerns. Psychiatry Res 141, 261-270.

57. Schredl, M. (2010). Characteristics and contents of dreams. Int Rev Neurobiol 92, 135-154.

58. Nofzinger, E.A., Mintun, M.A., Wiseman, M., Kupfer, D.J., and Moore, R.Y. (1997). Forebrain activation in REM sleep: an FDG PET study. Brain Res 770, 192-201.

59. Revonsuo, A. (2000). The reinterpretation of dreams: an evolutionary hypothesis of the function of dreaming. Behav Brain Sci 23, 877-901; discussion 904-1121.

60. Valli, K., Revonsuo, A., Palkas, O., Ismail, K.H., Ali, K.J., and Punamaki, R.L. (2005). The threat simulation theory of the evolutionary function of dreaming: Evidence from dreams of traumatized children. Conscious Cogn 14, 188-218.

61. Revonsuo, A., and Valli, K. (2008). How to test the threat-simulation theory. Conscious Cogn 17, 1292-1296; discussion 1297-1301.

62. Maloney, K.J., Mainville, L., and Jones, B.E. (2002). c-Fos expression in dopaminergic and GABAergic neurons of the ventral mesencephalic tegmentum after paradoxical sleep deprivation and recovery. Eur J Neurosci 15, 774-778.

63. Lena, I., Parrot, S., Deschaux, O., Muffat-Joly, S., Sauvinet, V., Renaud, B., Suaud-Chagny, M.F., and Gottesmann, C. (2005). Variations in extracellular levels of dopamine, noradrenaline, glutamate, and aspartate across the sleep--wake cycle in the medial prefrontal cortex and nucleus accumbens of freely moving rats. J Neurosci Res 81, 891-899.

64. Dahan, L., Astier, B., Vautrelle, N., Urbain, N., Kocsis, B., and Chouvet, G. (2007). Prominent burst firing of dopaminergic neurons in the ventral tegmental area during paradoxical sleep. Neuropsychopharmacology 32, 1232-1241.

65. Dzirasa, K., Ribeiro, S., Costa, R., Santos, L.M., Lin, S.C., Grosmark, A., Sotnikova, T.D., Gainetdinov, R.R., Caron, M.G., and Nicolelis, M.A. (2006). Dopaminergic control of sleep-wake states. J Neurosci 26, 10577-10589.

66. Carter, R.M., Macinnes, J.J., Huettel, S.A., and Adcock, R.A. (2009). Activation in the VTA and nucleus accumbens increases in anticipation of both gains and losses. Front Behav Neurosci 3, 21.

67. Delgado, M.R., Li, J., Schiller, D., and Phelps, E.A. (2008). The role of the striatum in aversive learning and aversive prediction errors. Philos Trans R Soc Lond B Biol Sci 363, 3787-3800.

REM SLEEP IN INSOMNIA

Kai Spiegelhalder *

Insomnia is one of the most prevalent health complaints in the European Union and worldwide and its prevalence will further increase with the greying of society. It is defined by difficulties initiating or maintaining sleep or non-restorative sleep, accompanied by significant daytime impairments (Morin & Benca, 2012).

Chronic insomnia afflicts about 10% of the population in western industrialised countries with women being more frequently affected than men and an increasing prevalence with older age. In most sufferers, insomnia is a chronic condition. More than half of the people experiencing insomnia today will still suffer from it next year. The disorder commonly occurs as a co-morbid condition in other medical or mental disorders. Primary insomnia (PI), an exclusionary diagnosis of poor sleep, ruling out psychiatric, medical, substance and additional sleep-related pathology, is estimated to affect approximately 3% of the general population.

Chronic insomnia is associated with diminished quality of life, increased fatigue, cognitive impairments, mood disturbances, and physical complaints. Furthermore, chronic insomnia confers an increased risk for mental disorders, especially major depressive disorder (Baglioni et al., 2011), and there is evidence that chronic sleep loss is a risk factor for cardiovascular disease and increased mortality (Kripke et al., 2002). Accordingly, primary insomnia leads to a huge increase in health care consumption and to a high rate of absenteeism, and, thus, to very high costs for our society. For the US, the costs of insomnia due to low work performance and absenteeism have been estimated to exceed 60 billion $ per year (Kessler et al., 2011). Thus, insomnia significantly contributes to the major diseases of our aging society and consequently to a significant part of the health expenses.

* Department of Psychiatry and Psychotherapy, University of Freiburg Medical Centre, Germany.

Despite the huge socio-economic impact of chronic insomnia, its pathophysiology is not well understood, yet. Current aetiological models of primary insomnia highlight the role of cognitive, emotional and physiological hyperarousal for the development and maintenance of the disorder (Riemann et al., 2010). However, despite a growing interest, the psychological and neurobiological mechanisms of insomnia are largely unknown. Understanding the mechanisms of chronic insomnia is essential to pave the way for the development of highly effective treatments. Thus, given the high prevalence and consequences of insomnia, it is a public health priority to understand the pathophysiology of the disorder in order to facilitate the development of widely applicable and effective treatment strategies.

As stated above, current insomnia models suggest a persistent hyperarousal on the cognitive, emotional and physiological level as a core component of its pathophysiology. To date, insomnia research almost exclusively focused on sleep continuity variables like sleep latency, total sleep time, wake after sleep onset, and overall ratings of sleep quality. However, the marked discrepancy between minor objectively documented sleep alterations and profound subjectively experienced impairment is unresolved. Concerning this, the importance of sleep misperception is strongly highlighted by investigations showing a large impact of sleep perception on daytime functioning (Harvey & Tang, 2012; Semler & Harvey, 2005). The Freiburg sleep research group proposed an 'instability' of REM sleep as an important factor underlying insomnia and explaining this discrepancy (Riemann et al., in press).

This view is primarily based on own evidence showing increased micro- and macro-arousals during REM sleep in human insomnia (Feige et al., 2008), a finding that has been replicated in the meantime (Feige et al., hitherto unpublished data, please refer to Figure 1).

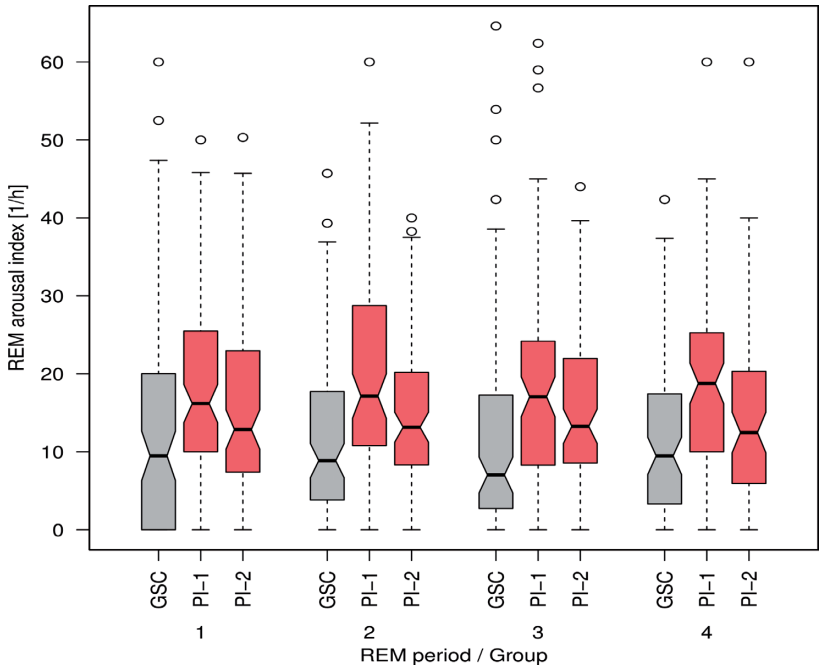

Figure 1. Comparison of the REM arousal index over the first 4 consecutive sleep periods. Data from 100 good sleeper controls (GSC; data taken from Feige et al., 2008), 100 patients with primary insomnia (PI-1, data taken from Feige et al., 2008) and another sample of 95 patients with primary insomnia (PI-2, unpublished data). The box plot notches indicate the nonparametric confidence interval for the median. Note that the notches do not overlap between primary insomnia patients (PI-1, PI-2) and good sleeper controls (GSC) for REM periods 2 and 3.

REM sleep represents the most highly aroused brain state during sleep and therefore seems prone to fragmentation in individuals with a persistent increased autonomic and cerebral arousal. The continuity hypothesis of dream production suggests that pre-sleep concerns of patients with insomnia, i.e. cognitions about being unable to sleep and consequences thereof, dominate their dream themes. Enhanced micro- and macro-arousals during REM sleep state may render these wake-like cognitions more accessible to memory storage and morning recall. This is assumed to result in subjective over-estimation of nocturnal waking time and the general experience of curtailed, poor and non-restorative sleep.

Beyond, chronic fragmentation of REM sleep contributes to REM sleep loss and a dysfunction in emotional limbic and paralimbic

brain networks that are specifically activated during REM sleep. This dysfunction along with attenuated functioning in executive frontal and prefrontal brain regions due to sleep loss might contribute to emotional and cognitive dysfunction and an elevated risk of developing depression (see Baglioni et al., 2011). It is suggested to broaden the hyperarousal concept of insomnia by adding a perspective including REM sleep. This approach might ultimately offer new avenues towards innovative therapeutic interventions for insomnia.

Future studies may investigate REM sleep perception in insomnia patients by using awakening techniques. Furthermore, it seems to be interesting to investigate the neurobiology of REM sleep arousals in insomnia patients by using simultaneous measurements of EEG and functional magnetic resonance imaging (fMRI).

References

Baglioni C, Battagliese G, Feige B, Spiegelhalder K, Nissen C, Voderholzer U, Lombardo C, Riemann D (2011). Insomnia as a predictor of depression: a meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, 135, 10-19.

Feige B, Al-Shajlawi A, Nissen C, Voderholzer U, Hornyak M, Spiegelhalder K, Kloepfer C, Perlis M, Riemann D (2008). Does REM sleep contribute to subjective wake to in primary insomnia? A comparison of polysomnographic and subjective sleep in 100 patients. *Journal of Sleep Research*, 17, 180-1 90.

Harvey AG, Tang NK (2012). (Mis)perception of sleep in insomnia: a puzzle and a resolution. *Psychological Bulletin*, 138, 77-101.

Kessler RC, Berglund PA, Coulouvrat C, Hajak G, Roth T, Shahly V, Shillington AC, Stephenson JJ, Walsh JK (2011). Insomnia and the performance of US workers: results from the American insomnia survey. *Sleep*, 34, 1161-1171.

Kripke DF, Garfinkel L, Wingard DL, Klauber MR, Marler MR (2002). Mortality associated with sleep duration and insomnia. Archives of General Psychiatry, 59, 131-136.

Morin CM, Benca R (2012). Chronic insomnia. *Lancet*, 379, 1129-1141.

Riemann D, Spiegelhalder K, Nissen C, Hirscher V, Baglioni C, Feige B (in press). REM sleep instability – a new pathway for insomnia? *Pharmacopsychiatry*.

Riemann D, Spiegelhalder K, Feige B, Voderholzer U, Berger M, Perlis M, Nissen C (2010). The hyperarousal model of insomnia: a review of the concept and its evidence. *Sleep Medicine Reviews*, 14, 19-31.

Semler CN, Harvey AG (2005). Misperception of sleep can adversely affect daytime functioning in insomnia. *Behaviour Research and Therapy*, 43, 843-85

LYING AWAKE OF INSOMNIA: IMAGING CAUSES AND CONSEQUENCES

Eus Van Someren *

Summary transcript of lecture read 29 March 2012, Porto, Portugal

I would like to start my lecture by thanking especially Fernando Lopes da Silva and Dick Bierman for the nice invitation and for giving me this opportunity to speak a bit longer than usual. I would also like to thank my team before starting rather than at the end of the lecture because without these people I would have nothing to tell. I also would like to thank Bial not only for inviting me here but also for making it possible to have an excellent meeting in Amsterdam, co-organized by Fernando, about Slow Brain Oscillations of Sleep, Resting State and Vigilance.[1]

Before I present you my ideas about brain mechanisms of insomnia, I think it could be good to start with a brief part of a movie. It takes only about 2 minutes. It is taken from a documentary made by Alan Berliner, both documentary maker and insomniac. In this movie he is in dialogue with his psychiatrist about how sleep should be. It starts with 'counting sheep'..... (part of movie shown)..... Please remember the phrase on how falling asleep should feel like: "That you never felt so comfortable in your life and the next thing is nothing". I will get back to this in my talk. The insomniac shown apparently does not recognize the comfort of being in his bed. You also witnessed that he has extremely active brain: counting sheep does not help, but rather continues into very large numbers. Finally, the insomniac shown is extremely sensitive to input to the brain. He is even disrupted by listening to the pulse of his own carotid artery. We all can if we put our fingers in our ears and pay close attention. But we usually do not hear the pulse of your carotid artery. This insomniac on the other hand can even be kept awake from that sound. If you want so see more of that documentary, it is called Wide Awake. I can highly recommend it.

* Vrije Universiteit, Amsterdam, and Department of Sleep and Cognition, Netherlands Institute for Neuroscience, Royal Academy of Arts and Sciences, The Netherlands.

Kai Spiegelhalder had an excellent job in introducing insomnia to you so I will be brief about that. It is the most prevalent sleep disorder. Also in general practice and in psychological practices, sleep complaints are very often reported. Estimates of the prevalence of chronic insomnia are between 6% and 10% in the general population and grow up to 40% in elderly people.[2] Insomnia has a strong impact on the quality of life, comparable to the impact other severe diseases have. There is an economic burden as well, for those that are more sensitive to monetary figures. Insomnia costs society money due to its effects on sick leave, loss of productivity, accidents and use of medical care.[3] And if this is not enough already, it is moreover a primary risk factor for the development of depression.[4]

Event though insomnia is the most prevalent sleep disorder, it is also the least understood sleep disorder. On individual routine sleep-EEG one often does not find systematic abnormalities. In larger samples, only small systematic differences in sleep stages or sleep duration may be found, as Kai Spiegelhalder showed in his presentation. There is a marked discrepancy between the severe complaints and reported lack of sleep, and what can be observed in the polysomnogram. It has likewise been difficult to objectively confirm the abundant complaints on daytime functioning. While insomniacs report that daytime functioning is difficult and requires a lot of effort, paper-and-pencil neuropsychological tasks usually suggest they perform quite well. The diagnosis is primarily based on subjective complains, as is the case for e.g. pain. We do not have any objective measure. This has resulted in a rather limited respect and acceptance of insomnia.

Why would it be so hard to find reliable abnormalities in insomnia? Let's consider the following hypothetical example. Suppose one has measured the number of nocturnal arousals in a large population. This results in a normal distribution. In the figure shown, every square represents one subject. Focus on the 8 differently coloured squares, representing 8 different people. Are the ones at the upper right of the distribution insomniacs? Suppose we also have, of everyone, their answer to another question: the time needed to fall asleep after an arousal. The eight highlighted persons have quite different positions within this second distribution. Yet another distribution may represent the daytime impact

of disrupted sleep. Although one may first consider persons in the upper tail of the distribution of any single variable to be candidate insomniacs, an insomniac may in fact be within the normal range and deviate only nonsignificantly on any single variable. A person with a nonsignificantly elevated number of arousals, a nonsignificantly elevated time required to fall asleep again and a nonsignificantly elevated daytime response to nocturnal sleep disruptions may in fact be the insomniac, because of the interactions between these variables. Others may have insomnia due to completely different profiles of unfortunate combinations of characteristics and sensitivities. It is clear from this example that combinations of variables are required for progress in our understanding of insomnia. One needs multivariate approaches.

In the Netherlands we have started to follow this approach by instigating the Sleep Registry (www.sleepregistry.org), a web-based survey assessment and database tool. Many people, both good sleepers and bad sleepers volunteer to visit the website every once in a while to fill out a survey or perform a computerized task. At present, the registry counts more than 10.000 participants which have filled out a few to many of the 48 surveys presently provided. Measurements include life history, health, personality, mood etc. Using these data and statistical approaches like latent class analysis, we will be able to define profiles, or multivariate fingerprints, of different subtypes of insomnia. We aim to make the platform available in other languages for other interested researchers. Anyone in any country that wants to use this and has maybe a PhD student who could do some translation work, feel free to contact our group. Together we could build an even larger database of information that helps us understand good and bad sleep.

Suppose we have a defined a specific subtype, what can be done next? An approach followed by mechanistic studies in psychiatry and other diseases, is to track down phenotypes to the genotype that puts one at risk. We know the phenotype of behaviour, cognition and consciousness is rooted in activation of the brain, the limits of which are in turn set by the structure of the brain, which in turn requires the building blocks local networks of neurons and other cells, built from proteins and coded by DNA. For a proper understanding of disease processes one ideally investigates the whole range from behaviour, cognition, consciousness

and complains, all the way up to the genotype that makes one vulnerable for the phenotype.

A first important question then of course is whether sleep characteristics are heritable at all. Indeed, twin-sibling studies indicate heritability,[5] even if we ask about how people slept last night – which may be quite variable.[6] A better signal to noise ratio may be obtained if we investigate heritability not only at the level of the phenotype of behaviour, cognition, consciousness and complains, but also a bit up on the ladder. So-called endophenotypes quantify e.g. brain activation and structure. There is a considerable heritability at the level of brain activation in the sleep EEG profile,[7,8], at the level of brain structure indicated by cerebral cortical properties,[9] and at the level of the cortical balance between inhibitory and excitatory neuronal networks as indicated by transcranial stimulation (TMS).[10]

This quite long introduction was meant to provide the general line of reasoning behind our research approach. I will now present an example of what we may find if we do a very strict selection of one specific insomnia phenotype, rather than continuing research on heterogeneous samples. We selected 25 insomniacs from a group of 324. The selected ones were exactly the same as the controls with respect to depressive complains, anxiety, age, life history, cognitive functioning etcetera. They only differed with respect to sleep complains. Note that it was not our purpose to have a representative sample, which may include several different subtypes, e.g. with varying degrees of anxiety or depressive symptoms.

In this specific subgroup, we first performed investigations on simple and slightly more complex reaction time tasks.[11]. Insomniacs differed markedly from controls in their reaction time profile. They responded faster on the simple task, yet slower on the complex task. The elevated 'cost of complexity', as this reaction time difference between simple and complex task performance can be called, normalized however after intense multimodal sleep therapy. This indicates that the elevated cost of complexity is a consequence of insomnia, rather than a risk marker that persists no matter whether insomnia is currently present in people at risk.

A second study in this specific subgroup stepped up on the ladder from behaviour to genotype by investigating brain activation using functional magnetic resonance imaging (fMRI) during an executive task,

verbal fluency.[12] Insomniacs and carefully matched controls underwent functional magnetic resonance imaging (fMRI) scanning during the performance of a category and a letter fluency task. Compared to controls, the select group of insomniacs showed hypoactivation of the medial and inferior prefrontal cortical areas (Brodmann Area 9, 44-45). This insufficient prefrontal activation normalized however after intense multimodal sleep therapy. This indicates that insufficient prefrontal activation is a consequence of insomnia, rather than a risk marker that persists no matter whether insomnia is currently present in people at risk.

A third study in this specific subgroup stepped up on the ladder from behaviour to genotype even further by investigating brain structure using voxel-based morphometry.[13] Compared to controls, the select group of insomniacs showed a decrease in orbitofrontal gray matter volume that strongly correlated with the severity of their complaints, but not at all with the duration of their complaints. This suggests that attenuated orbitofrontal gray matter may be an endophenotype marking the risk to develop of at least one particular subtype of insomnia. Involvement of attenuated orbitofrontal gray matter in sleep vulnerability was recently supported by a study showing its association with early morning awakening[14] and has been proposed to be associated with attenuated comfort sensing.[15, 16] Indeed, if example small deviations from optimally comfortable temperature for sleep would go unnoticed, they might interfere with sleep.[17, 18]

A fourth study in this specific subgroup of insomniacs stepped up on the ladder from behaviour to genotype even further by investigating cortical excitability using absolute and relative amplitudes of motor evoked potentials in response to single- and paired-pulse stimulation using TMS.[19] Insomniacs showed an exaggerated absolute response to both suprathreshold single- and paired-pulse stimulation compared with control participants. They moreover showed a reduced relative response to paired-pulse stimulation at long interpulse intervals, indicating a reduced intracortical facilitation. In case of the TMS results, the abnormalities persisted after the intense sleep therapy that effectively improved sleep quality. The results suggest that a subtly disturbed intracortical excitability may be an endophenotype marking the risk to develop at least one particular subtype of insomnia.

In summary, we have tried, in one specific subgroup of insomniacs to find abnormalities along the ladder from behaviour, cognition, consciousness and complaints all the way up towards the balance in neuronal networks. Valuable endophenotypes may be the cortical excitability and gray matter. The findings are somewhat surprising because they do not easily fit in our current concept of sleep regulation. The current model posits an interaction between a 24-hour clock that makes you more likely to sleep at night and wake during the day, and a homeostatic component that increases sleep pressure with increasing time awake. The orbitofrontal cortex and cortical excitability do not fit in easily, illustrating that we should keep an open mind in our search for mechanisms involved in insomnia. The focus on a clock and a homeostat may have obscured that there are in addition rather trivial factors that may be called "sleep requirements".[16] If we're not thermally comfortable, it is not wise to sleep. It is not wise to fall asleep either if we are in an upright standing posture, or in danger. The brain should check these sleep requirements and signal sleep-regulating structures whether or not they are met. If not, it is not wise to shut off your consciousness and go to sleep. Abnormalities in these signalling pathways may be involved in different subtypes of insomnia.

References

1. Van Someren EJW, Van Der Werf YD, Roelfsema PR, Mansvelder H, Lopes da Silva F, editors. Slow Brain Oscillations of Sleep, Resting State and Vigilance. Amsterdam: *Elsevier*, 2011.

2. Kraus SS, Rabin LA. Sleep America: managing the crisis of adult chronic insomnia and associated conditions. *J Affect Disord* 2012;138:192-212.

3. Leger D, Bayon V. Societal costs of insomnia. *Sleep Med Rev* 2010;14:379-389.

4. Baglioni C, Battagliese G, Feige B, et al. Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies. *J Affect Disord* 2011;135:10-19.

5. Watson NF, Goldberg J, Arguelles L, Buchwald D. Genetic and environmental influences on insomnia, daytime sleepiness, and obesity in twins. *Sleep* 2006;29:645-649.

6. Boomsma DI, van Someren EJ, Beem AL, de Geus EJ, Willemsen G. Sleep during a regular week night: a twin-sibling study. *Twin Res Hum Genet* 2008;11:538-545.

7. De Gennaro L, Marzano C, Fratello F, et al. The electroencephalographic fingerprint of sleep is genetically determined: a twin study. *Ann Neurol* 2008;64:455-460.

8. Ambrosius U, Lietzenmaier S, Wehrle R, et al. Heritability of sleep electroencephalogram. *Biol Psychiatry* 2008;64:344-348.

9. Thompson PM, Cannon TD, Narr KL, et al. Genetic influences on brain structure. *Nat Neurosci* 2001;4:1253-1258.

10. Pellicciari MC, Veniero D, Marzano C, et al. Heritability of intracortical inhibition and facilitation. *J Neurosci* 2009;29:8897-8900.

11. Altena E, Van Der Werf YD, Strijers RLM, Van Someren EJW. Sleep loss affects vigilance. Effects of chronic insomnia and sleep therapy. J Sleep Res 2008;17:335-343.

12. Altena E, Van Der Werf YD, Sanz-Arigita EJ, et al. Prefrontal hypoactivation and recovery in insomnia. *Sleep* 2008;31:1271-1276.

13. Altena E, Vrenken H, Van Der Werf YD, Van Den Heuvel OAV, Van Someren EJW. Reduced orbitofrontal and parietal grey matter in chronic insomnia: a voxel-based morphometric study. *Biol Psychiatry* 2010;67:182-185.

14. Stoffers D, Moens S, Benjamins J, et al. Orbitofrontal gray matter relates to early morning awakening: a neural correlate of insomnia complaints? *Front Neurol* 2012;in press.

15. Raymann RJEM, Van Someren EJW. Diminished capability to recognize the optimal temperature for sleep initiation may contribute to poor sleep in elderly people. *Sleep* 2008;31:1301-1309.

16. Romeijn N, Raymann RJ, Most E, et al. Sleep, vigilance, and thermosensitivity. *Pflügers Archiv Eur J Physiol* 2012;463:169-176.

17. Raymann RJEM, Swaab DF, Van Someren EJW. Cutaneous warming promotes sleep onset. *Am J Physiol* 2005;288:R1589–R1597.

18. Raymann RJEM, Swaab DF, Van Someren EJW. Skin deep: cutaneous temperature determines sleep depth. *Brain* 2008;131:500-513.

19. Van Der Werf YD, Altena E, van Dijk KD, et al. Is disturbed intracortical excitability a stable trait of chronic insomnia? A study using transcranial magnetic stimulation before and after multimodal sleep therapy. *Biol Psychiatry* 2010;68:950-955.

DREAM ESP STUDIES BEFORE MAIMONIDES: AN OVERVIEW, 1880s - 1950s[1]

Carlos Alvarado *

Writing in her influential and widely cited book The Night-Side of Nature, published in 1848, English writer Catherine Crowe referred to "dreams ... which partake of the nature of second sight, or prophecy ... some being plain and literal in their premonitions, others allegorical and obscure; whilst some also regard the most unimportant, and others the most grave events of our lives" (Crowe, 1848, Vol. 1, p. 57). These dreams, now referred to as ESP dreams, are the topic of this paper.

Crowe illustrated the features of these dreams with accounts such as the following one:

Mrs. W dreamed that she saw people ascending by a ladder to the chamber of her step-son John; wakes, and says she is afraid he is dead, and that there was something odd in her dream about a watch and a candle. In the morning a messenger is sent to inquire for the gentleman, and they find people ascending to his chamber-window by a ladder, the door of the room being locked. They discover him dead on the floor, with his watch in his hand, and the candle between his feet. (Vol. 1, p. 64)

As can be seen in Crowe's volume, ESP was not only associated with dreams but also with various other altered states of consciousness. Nonetheless dreams have always commanded a special interest in writings about psychic phenomena. In addition to Crowe, numerous nineteenth-century authors mentioned psychic dreams in their works, among them German philosopher Carl du Prel (1899/1907), German physician J.H. Jung-Stilling (1808/1851), British physician Herbert Mayo (1851),

1 I wish to thank the Bial Foundation for their past support of my research as well as for inviting me to present this paper as part of the panel discussion "Dreams and Anomalous Cognition." I am also grateful to Caroline Watt and Dick Bierman for organizing the panel, to Massimo Biondi and Lori Derr for help with references, and to Nancy L. Zingrone for useful editorial suggestions to improve this paper.

* Scholar in Residence, Atlantic University, USA.

and Scottish social reformer Robert Dale Owen (1860). Not only have authors such as these mentioned many cases, but the relationship of dreams with ESP has received attention in modern times as well (e.g., Child, 1985; Krippner, 1991, 2007; Sherwood & Roe, 2003; Ullman, Krippner, with Vaughn, 2001; Van de Castle, 1977). However, except for some brief mentions, in this paper I will not enter into antiquity nor into the modern era. I will confine my discussion to an overview of trends in the study of ESP dreams conducted before the well-known experimental studies that took place at the Maimonides Medical Center in Brooklyn, New York, from the 1960s to the early 1970s (e.g., Krippner, 1970; Krippner, Ullman, & Honorton, 1971; Ullman & Krippner, 1969; Ullman, Krippner, & Feldstein, 1966; for overviews see Child, 1985; Ullman & Krippner, 1970; and Ullman, Krippner, with Vaughn, 2001).

Rather than defend the existence of ESP in dreams, or focus on theoretical ideas, in this paper I will highlight trends, approaches, methodology, and both study findings and observations that took place between the late nineteenth-century and the 1950s. Because of the paucity of experimental work in the area for the period in question I concentrate on the study of cases, generally referred to in parapsychology as spontaneous cases.

Prolegomena

The topic of ESP dreams is part of the general topic of the relationship between altered states of consciousness and a variety of unusual phenomena which, in addition to ESP, include possession, mediumship, healings and the various phenomena that have been reported in religious contexts, somnambulism, and hypnosis throughout history (Cardeña & Alvarado, 2011; Inglis, 1989; Sluhovsky, 2011; Taves, 1999; Ustinova, 2011). Alterations of consciousness, including that which occurs in dreams, have been part of the research and theoretical agenda of parapsychology from the beginnings of the movement (Alvarado, 1998; Kelly & Locke, 2009; Luke, 2011; Parker, 1975; Shapin & Coly, 1978).

One of the oldest relationships between dreams and unusual phenomena come from discussions and experiences of divination. As argued by Auguste Bouché-Leclercq in his classic work Histoire de la

Divination Dans l'Antiquité: "If there is a form of divination in support of which we can invoke testimony of universal approval, it is definitively the interpretation of dreams ... There is no people during antiquity, and almost no individuals who have not believed in a divine revelation through dreams ..." (Bouché-Leclercq, 1879, Vol. 1, p. 277; this, and other translations, are mine). In fact - and in addition to works such as those of Bouché-Leclercq and others (e.g., Halliday, 1913, pp. 128-134; Maury, 1860, Second Part, Chapter 1) - there is much information about the ancient history of the topic in recent studies of dreams covering antiquity to the nineteenth-century (e.g., Holowchak, 2002; James, 1995; Miller, 1994; Pick & Roper, 2004; Van de Kemp, 1981).

Many writers from antiquity - among them Aristotle (1902) and Cicero (1853) - discussed divination in dreams. Dream divination in particular, and ESP in altered states of conscious in general, have been related since antiquity to the idea that the soul has unexplained powers that are inhibited by the physical body. It is believed that these powers manifest when the workings of the body are weakened or diminished through the use of drugs or under the influence of a variety of natural states of consciousness, such as dreams. Cicero entertained this notion when he presented dialogues for and against divination. In a section of his treatise he argued that nature "teaches us how great is the energy of the mind when abstracted from the bodily senses, as it is most especially in ecstasy and sleep," going on to state that "when the soul of man is disengaged from corporeal impediments, and set at freedom, either from being relaxed in sleep, or in a state of mental excitement, it beholds those wonders which, when entangled beneath the veil of the flesh, it is unable to see" (Cicero, 1853, p. 198).[2]

In addition to such works as Aristotle's (1902) and Cicero's (1854) many discussions of the topic were made public in antiquity (Egidi, 1949), and many of these included what we would now call dream ESP cases. An interesting later example appears in John Aubrey's Miscellanies (1721), in which the fifth chapter included a variety of ESP dreams published

2 Other examples from antiquity include Apuleius (1853, p. 291), Iamblichos (1911, p. 111) and Xenophon (1847, p. 328). The idea continued into later periods (e.g., Macario, 1857, p. 234) and has been modified in more recent times, particularly in removing the concept of the soul from the discussion, as can be seen in ideas of noise reduction (e.g., Honorton, 1977).

in ancient to medieval sources. In addition, Aubrey included a case he himself had heard about: "A Gentlewoman of my acquaintance dreamed, that if she slept again, the House would be in danger to be Robb'd. She kept awake, and anon Thieves came to break open the House; but were prevented" (p. 64).

Accounts of this sort continued into the nineteenth-century, the period at which I will start my discussion. For example, ESP dreams are mentioned in works of mesmerism such as William Gregory's Letters to a Candid Inquirer, on Animal Magnetism (1851), in which he stated "I think it probable, à priori, that the state of spontaneous clairvoyance, like natural somnambulism, occurs much more frequently in the sleeping than in the waking state. We all know how heterogeneous dreams often are; but it is very far from being impossible, or even improbable, that, in certain persons, many of their dreams are the result of true clairvoyance" (p. 142). Similarly, some of the spiritualistic literature - works such as Robert Dale Owen's Footfalls on the Boundary of Another World (1860, Book 2, Chapter 2) - both contained cases and a defence of the reality of these dreams even though authors were aware of the possibility that many ESP dreams might possibly be explained through more conventional means.

A skeptical tradition did exist during the nineteenth-century through which period (following on ideas from the previous century, Tavera, 2000) many seemingly ESP dreams were understood as physiologically-based and shaped by the experiences of the preceding day. An example was the case of French physician Alfred Maury who, in his book Le Sommeil et les Rêves (1861), saw dreams as "open to instinctive and automatic impulses" (p. 7). For Maury sleep was described as a state in which there was a diminution of functions: "The circulation gets slower; breathing and digestion are less active; the muscular movements have ceased almost completely, and the senses are dulled, or three quarters abolished" (p. 7). Other writers of the era reminded us that dreams consisted of "past remembrances and associations following each other" (Briere de Boismont, 1855, p. 202).

Many authors accounted for psychic dreams as coincidences, malobservation, forgotten ideas, anxiety, or unconscious perception (e.g., Delage, 1891; Macnish, 1834; Maury, 1861; Simon, 1888). English physician John Addington Symmonds, in his book Sleep and Dreams (1851), presented some criteria for the acceptance of "prophetic" dreams.

He wrote:

1stly. We must remember that the testimony is single, and, so far, less to be trusted than were it confirmed by the experience of others ...

2ndly. If the dream comes to us second-hand, we must remember that the love of the marvellous, so inherent in man, renders the hearer as prone to believe, as the narrator to dress up a wonderful story. The relaters of the most real events are but too prone to modify and add to their stories, or to suppress circumstances, in order to make them fit some particular view...

3rdly. We must reject all cases in which the verification of the dream may be explained on other principles than that of a real prophetic power. Of these principles, the first that occurs to our notice is casual or fortuitous fulfilment. The sense I here attach to fortuitous is this. The event in the dream, and its subsequent corresponding event, happen near together, but are dependent on different trains of causes ... The principle of mere coincidence, then, will explain many fulfilments of dreams as they are called; and it must not be presumed that it is not mere coincidence, because the dreams are of an unusually interesting character. When one thinks of the vast number of dreams which happen to every one in proportion to the number that come true, I only wonder the fulfilments are so rare (pp. 74-76).

Psychical research developed out of the movements of mesmerism and spiritualism.[3] For example the Society for Psychical Research (SPR) was founded in London in 1882 by scientists, scholars and others, including members of the spiritualist community, to test the evidentiality of claims raised in mesmerism and spiritualism. The Society's initial studies of ESP - both in terms of cases as in experiments - as well as studies of apparitions, mediumship, and dissociation in general, were very important for the development of parapsychology (for overviews see Alvarado, 2002; and Gauld, 1968). Although much of this work emphasized the reality of the phenomena the SPR's work also contributed to the study of features, methodology, as well as a critical outlook in that SPR members routinely presented a variety of conventional possible explanation, among them coincidence, fraud, hallucination and sensory and motor automatisms.

3 For discussions of the development of psychical research in different countries see Biondi (1988), Monroe (2008), Moore (1977), Oppenheim (1985), and Wolffram (2009).

For example, in a book on telepathic experiences the authors argued:

The first objection to dreams, as evidence for transferred impressions of distant conditions or events, is this - that dreams being often somewhat dim and shapeless things, subsequent knowledge of the conditions or events may easily have the effect of giving body and definiteness to the recollection of a dream. When the actual facts are learnt, a faint amount of resemblance may often suggest a past dream, and set the mind on the track of trying accurately to recall it. This very act involves a search for details, for something tangible and distinct; and the real features and definite incidents which are now present in the mind, in close association with some general scene or fact which actually figured in the dream, will be apt to be unconsciously read back into the dream...

But there is a more general and sweeping objection. Millions of people are dreaming every night; and in dreams, if anywhere, the range of possibilities seems infinite; can any positive conclusion be drawn from such a chaos of meaningless and fragmentary impressions? Must not we admit the force of the obvious à priori argument, that among the countless multitude of dreams, one here and there is likely to correspond in time with an actual occurrence resembling the one dreamed of; and that when a dream thus "comes true," unscientific minds are sure to note and store up the fact as something extraordinary, without taking the trouble to reflect whether such incidents occur oftener than pure chance would allow? ...

In the first place, it is to be noted that there has, so far, been a complete lack of the statistics which alone could form the basis for an answer to these questions. It has never been known with any certainty what proportion of people habitually dream, what proportion of dreams are remembered at all, in what proportion of these remembered dreams the memory is evanescent, and in what proportion it is profound and durable... (Gurney, Myers & Podmore, 1886, Vol. 1, pp. 298-300)

Another psychical researcher and SPR leader, Eleanor Sidgwick (1889, p. 289), wrote about aspects of the recollection of dreams. In her view "our memory for dreams being less vivid and less trustworthy than our memory for waking experiences, details are more apt to be unconsciously read back into dreams, so that the dreams assume a definiteness and precision and fullness of detail which do not really belong to them. This

source of weakness is excluded, if the dream has been told to some one else before the fulfilment arrives ..." (p. 312). Similarly, psychical researcher and classical scholar Frederic W.H. Myers (1892a, 1892b) also focused on conventional explanations of some psychic dreams. In his view the subliminal mind could inspire dreams from knowledge the person may have acquired through sense perception but that was not consciously recalled.

With this as a background I will discuss observations and research with such cases (single cases and groups of cases) that were conducted from the nineteenth-century up to the late 1950s. I will only discuss studies of cases because of the scarcity of experimental attempts to induce ESP in dreams (for a few exceptions see Daim, 1954, Ermacora, 1895, 1898, and Weserman, 1820) in that period of history. The scene changed from the 1960s because of the experimental program established at the Maimonides Medical Center (Ullman, Krippner, with Vaughn, 2001) and elsewhere (Sherwood & Roe, 2003).

Single Case Studies

Similar to other areas of the study of human experiences and behavior, work on the topic of psychic dreams began with attention paid to specific accounts. Not only do we find those reports in many of the above-mentioned books (e.g., Crowe, 1848; Owen, 1860), but also in a variety of other sources. For example the mesmeric English journal Zoist (e.g., Cottrell, 1853; Davey, 1850; Roffe, 1848), as well as the periodicals of the spiritualist movement (e.g., A Child's Life, 1869; Wallace, 1878; Warning Dream, 1849) published such cases. However, these accounts, and many others like them, were reported by the experiencers or narrated second-hand by someone else with no attempt to corroborate the testimony of the original experiencers. In some ways these early case reports were testimonies to the marvellous, called to bear witness on the power of the mind and the spirit and did not represent a scientific approach to the topic. In later years many single case reports appeared that improved the situation somewhat, but in general very little was done with the cases in these early times, particularly in the documentation of the psychology of the persons having the experiences. Such criticism may

also be raised about some late 19th and early 20th century case reports (e.g., Bozzano, 1905; De Witt, 1897; Dream, 1907; Newbold, 1901; Paulhan, 1892; Warcollier, 1908).

In one such case report Swiss psychologist Théodore Flournoy (1905) documented what seemed to be an ESP dream and leaned towards a telepathic interpretation of it after considering such aspects as fraud, subconscious inference, suggestion, and coincidence. Interestingly Flournoy noticed that the case showed two elements at the same time. This was "on one hand remarkable exactitude of the recollections about the essential content of the oniric prediction, and on the other hand a considerable alteration of related circumstances, in terms of a simplification of the topic of the dream, and a dramatization of the case as a whole to make it more impressive ..." (p. 62). Here Flournoy intimated that even in veridical dreams the content could be distorted by the mind of the experiencer, or by the normal process of recollection.

The idea that the mind could distort the telepathic content of a dream was one prevalent in the case studies of psychoanalysis. Sigmund Freud discussed the topic in several papers, "Dreams and Telepathy" (Freud, 1922) being one example.[4] Here he clearly said he was not going to address the issue of the existence of telepathy. In his view: "Telepathy has no relation to the essential nature of dreams; it cannot deepen in any way what we already understand of them by analysis. On the other hand, psycho-analysis may do something to advance the study of telepathy, in so far as, by the help of its interpretations, many of the puzzling characteristics of telepathic phenomena may be rendered more intelligible to us ..." (Freud, 1922, p. 304). Telepathy, he speculated, may be related to the Oedipus complex. In a later article Freud argued that one may arrive at a provisional opinion about the existence of telepathy. He wrote: "There would ... be nothing contradictory in the material that had been telepathically communicated being modified and transformed in the dream like any other material" (Freud, 1925/1953a, p. 90).

4 I will not discuss here all of Freud's writings about telepathy and dreams. A short overview of the topic is Smith's (2002). Freud's writings on the issue have been reprinted by Devereux (1953, Part 2). Wilhelm Stekel discussed the topic before Freud in his book Der telepathische Traum (1920), in which he proposed that such emotions as love and jealousy predisposed people (or his patients) to telepathy.

Freud (1933/1953b) later specified some of these dynamics. In one case a man wrote to him about a dream he had about his wife having twins. The man had a daughter who was expecting a baby in December and the dream took place in November. The dream referred to his second wife, the stepmother of his daughter, with whom he did not have sexual relations and whom he did not consider fit to raise a child. He wrote to Freud because his daughter had twin babies before December, presumably the night of the dream. Freud analyzed the dream as follows:

Here is a man, dissatisfied with his second wife, who would prefer to have a wife like his daughter by his first marriage. In the unconscious this "like" is naturally omitted. Now during the night he receives the telepathic communication that his daughter has had twins. The dream work seizes on this information, allows his unconscious wish that his daughter should replace his second wife to act upon it, and thus emerges the singular manifest dream in which the wish itself is veiled and the message distorted. We must admit that only dream interpretation has shown us that this is a telepathic dream; psychoanalysis has discovered a telepathic event which we should not otherwise have recognized as such. (p. 97).

Later psychoanalysts continued along the same line in their analyses of cases. For example Nandor Fodor (1942) stated in relation to telepathy that "the clue to a complete understanding of a dream sometimes lies in an event which we cannot know about through the patient's associations alone and that, in some instances, we may find the missing clue by analysing our own dreams in relationship to our patients" (p. 85). Similar discussions, as well as analyses of dynamics such as transference and counter-transference, were present in the works of other psychoanalysts who treated the topic of telepathic dreams (e.g., Ehrenwald, 1950; Eisenbud, 1948; Servadio, 1956; see also Devereux, 1953).

Incidental work also was reported with single dream cases, but most of this consisted only of the recording of the events so as to determine whether such dreams could yield to conventional explanations or not (e.g., Bozzano, 1905; Case, 1947; Grensted, 1950; Incidents, 1911). The interest in establishing veridicality - a central point in parapsychology - has guided most case research on the subject.

Studies of Groups of Cases

The most important of studies of groups of cases began with members of the SPR. An initial examination of cases was published in the first report of the Society's Literary Committee (Barrett, Massey, Moses, Podmore, Gurney, & Myers, 1882). But the deepest and most throrough review appeared in the first major work of the SPR, Gurney, Myers and Podmore's Phantasms of the Living (1886). Phantasms almost immediately became one of the central works of nineteenth-century psychical research. The authors of Phantasms undertook a systematic study of cases of spontaneous telepathy. In the book they developed the idea that a telepathic message from a distant agent could be expressed by another person at a distance, usually a spouse or a family member of the agent, manifesting through various senses such as vision and hearing, as well as in dreams, and through intuitions, and somato-sensory experiences. The authors of Phantasms were particularly interested, from their initial examination of published cases and their own preliminary collection (Barrett et al., 1882), in cases that coincided with the death of someone at a distance, or with some crisis such as illness and accident. Seven hundred and one cases were collected gleaned from a larger collection, many of which were obtained through public appeals. Each case was checked for evidentiality, with specific attention paid to the manner in which the veridical element was corroborated. The book is arguably the best nineteenth-century discussion of the evidential problems posed by telepathy cases on record. In addition to painstaking attempts to obtain corroboration - all of which was presented together with each case - the researchers discussed various forms of distortion of testimony, as well as the problem of chance.

One of the questions the authors had circulated in the press was: "Since January 1st 1874, have you ever had a dream of the death of some person known to you, which dream you marked as an exceptionally vivid one, and of which the distressing impression lasted for as long as an hour after you rose in the morning?" (Gurney, Myers & Podmore, 1886, Vol. 1, p. 304). The question was answered by 5360 individuals of which 173 gave a positive reply. However, after corrections for repeated dreams, it was concluded that 202 was a more representative number:

With this substitution, 1/26 of the whole number of persons asked may be taken to have given an affirmative answer. Now, the persons asked were a quite promiscuous body, and a body large enough to be safely regarded as a fair average sample of the population; just as a similar number of persons, taken at random, would be accepted as a fair sample for purposes of statistics on short sight, or colour-blindness. We may conclude, then, that the number of persons who can recall having had - during the twelve years 1874-1885, and without special assignable cause - the experience named in the question, amount to about 1 in 26 of the population of this country (Vol. 1 pp. 304-305).

While we cannot assume representativeness in a sample collected from the press and in other ways,[5] this was an important pioneering effort to address the issue of prevalence empirically. Before this work no one had tried to do anything about the problem. Previous writers only mentioned that chance could account for what was perceived as meaningful coincidences.

Other questions asked for experiences while the person was awake. The book included 701 telepathy cases, out of which 163 (23%) were dreams. There were 149 actual dream cases included in the book, 79 (53%) of which were about someone's death. The authors of Phantasms engaged in statistical speculations and arrived at the conclusion that reports of dreams about death were "larger than doctrine of chances would have allowed us to expect" (Vol. 1, p. 307). Once again, and regardless of the validity of such analyses, the authors of the study pioneered an empirical approach to the subject that had not been seen in this scale in the prior literature on the topic.

Such empirism is further seen in the fact that the authors pointed out they had 107 first- hand testimony dream cases included in their analysis:

72 are alleged to have been described, 11 more to have been recorded in writing (in one instance by a relative of the dreamer's), and 9 more to have been in some marked way acted on, before the corresponding event was known; and in 46 of the 72 cases where the dream was at

5 In the book it was not specified who was targeted with the question. In another publication members of the SPR were mentioned as possible participants in the survey and hopes were expressed that the question may be presented to others who "without any selection of those persons only who have unusual facts to relate" (Circular, 1883, p. 303).

once described, we have also the testimony of the person to whom it was described. In 18 other cases, we have the testimony of the person to whom the dream was described before the corresponding event was known, but not the dreamer's own account. (Vol. 1, p. 309)

The Phantasms authors speculated that the telepathic element (of which there was not actual explanation) combined with the percipient's dream imagery to form a veridical dream that manifested in the typical way of dreams. That is, sometimes using fantastic and symbolic imagery.

Some dream cases were also collected in the United States on behalf of the American Society for Psychical Research (Royce, 1889), but they were not analyzed in detail. Another SPR worker, Eleanor Sidgwick (1889), discussed dreams in a paper she wrote in which she evaluated the evidence for premonitions, and found it to be inconclusive. She stated that about two-thirds of the premonitions examined took place during dreams. Sidgwick discussed the content of these dreams, including those that referred to death, accidents, winning races, and trivial incidents. She noticed both the occurrence of symbolic dreams and their lesser evidential value. Sidgwick argued:

Two kinds of dreams may be called symbolic: firstly, those where the dream is unlike the real fact but yet has in it an underlying idea which suggests the fact ... Such dreams may vary to any extent in the degree of their correspondence with the supposed fulfilment, and in some cases might perhaps be more properly called grotesque or distorted dreams rather than symbolic ones. In the other kind of symbolic dreams the symbol has no resemblance to the fact supposed to be indicated. The interpretation is, so to speak, purely conventional ... There is no difficulty in supposing that the mind might clothe a premonitory (or telepathic) idea in a symbolic form once the "convention" is started, and this might be done either by tradition, or by the first coincidence of the dream and event in the dreamer's experience, the same dream afterwards recurring in apparent connection with similar events. (p. 351)

Sancte de Sactis, an important Italian psychologist, wrote about the topic in his book I Sogni (1899). He referred to his "numerous inquiries on the dreams of ordinary and abnormal people" (p. 370) in which he looked for those dreams but found that "a large part of these tales are so vague and poorly documented that they do not deserve the attention

of the psychologist" (p. 370). Later in the book he stated: "I have to confess that from a total of at least 55 dreams designated as extraordinary or marvellous by the dreamer I did not find a single one that ... resists scientific critique" (p. 384). Like other commentators in the psychological literature, de Sanctis was skeptical of the phenomena and offered the usual conventional explanations.

Another nineteenth-century skeptic was American psychologist Mary Whiton Calkins, who discussed the topic briefly in her "Statistics of Dreams" (1893). She analyzed 375 dreams recorded by two persons finding five cases of dreams about the future. Following on Calkins, others found one participant who had reported several veridical dreams (Weed, Hallam, with Phinney, 1895). Most of the dreams referred to trivial topics but a few were about "more significant events, as when a dream-letter announcing illness is followed by an actual letter of the same sort, and as when a death which later really occurs is announced in a dream" (p. 411).

Many cases were presented and discussed in terms of both evidentiality and specific features (e.g., Rogers, 1916; Vesme, 1901). French astronomer and psychical researcher Camille Flammarion (1900) compiled numerous ESP cases - including dreams, intuitions and visions - after having appealed for such cases in the Annales Politiques et Litteraires. Many of the dreams he collected centered on dying persons. Although Flammarion did not consider dreams to be the best evidence for telepathy, he stated that "a large number of these dreams ought to be accepted as positive evidence of a relation of cause and effect between the mind of the dying person and that of the percipient. The exactitude of detail is clearly established" (p. 364).

Ernesto Bozzano (1907) analyzed the symbolic character of different types of psychic phenomena, noting that symbols took place during dreams. In his view if a symbol of a premonitory dream took place several times "it gradually gains in distinctness, so that sometimes it loses its symbolic character and takes a more directly representative form" (p. 351). In a later study of published precognitive experiences Bozzano (1913, pp. 7-8) remarked that precognitive dreams were more labile than other dreams. They were more vivid than ordinary dreams but, according to Bozzano, were also easier to forget even though the dream had been seen as more vivid than ordinary dreams more likely to have been discussed.

An interesting investigation was that of psychology Professor Ágúst Bjarnason's (1915) who studied seemingly psychic dreams produced by Icelandic dreamer Jóhannes Jónson, known locally as "Dreaming Joe." While asleep this person was reported to tell "people the whereabouts of lost things ... besides informing them of various things that they are desirous of knowing" (pp. 54-55). Jónson concentrated his thoughts before he went to sleep to get the information requested of him. Bjarnason collected testimonies that he felt supported the claims for veridical dreams. His attempts to elicit dreams to test Jónson were not successful (for comments on Bjarnason's research see Verrall, 1915).

Over the years many others compiled veridical dream cases with little attempt to analyze them beyond illustrating what the authors believed were their veridical elements (Hill, 1918, Chapter 2; Prince, 1918, 1919, 1922). French psychical researcher Réne Warcollier discussed in his book La Télépathie (1921, Chapter 5, Part C) many cases of such dreams, some of which were his own (see Warcollier, 1908). He noted that some cases were symbolic and that many announced various things such as visits, letters and death. Other writers recorded their own dreams (e.g., Shipley, 1908). The best known example was J.W. Dunne's (1927) compilation of many of his own precognitive dreams, which inspired him to develop theoretical ideas about time. This line of research - the self-recording of dreams - was followed by Kooy (1934) in Holland, and by others in more recent times, the content of which lie beyond the scope of this paper (de Pablos, 1998; Sondow, 1988).

In a later analysis of questionnaire data originally collected by Royce (1889), Prince (1921) stated that there were 7969 replies to a question about dreams about someone's death which was exceptionally vivid and which produced distress at least for an hour after waking up. Four hundred forty-nine replies to the initial solicitation claimed such dreams.

In England Theodore Besterman (1933) analyzed the dreams of persons that agreed to participate in an investigation of precognitive dreams. He wrote:

Forty-three subjects sent in 430 records of dreams, an average of ten each ... These forty-three subjects, then, put forward forty-five events in their dreams as being possibly precognitive, or an average of just over one apiece. Of these forty-five cases I regard eighteen as having a prima facie case, of

which two have a good case. I do not regard any of these eighteen cases as capable of being regarded as conclusive instances of precognition. (p. 204)

Some case collection studies were published by various authors in later years (Hart & Hart, 1933; Levi Bianchini, 1946, 1950; Marulli, 1953). In one of them, Hart and Hart (1933) presented 15 examples of reciprocal dreams, in which there was a "reciprocal perception of each other by two or more percipients, in a common dream environment" (p. 234). Saltmarsh (1934) studied different forms of precognition experiences. His collection had 94 dreams and the rest were experiences during mediumistic communications (41), hallucinations (23) impressions (17), crystal gazing (4) and borderland states (4). He saw dreams as a form of dissociation in which subliminal messages could come to conscious attention easily.

A particularly interesting study was a collection of 1300 dreams analyzed for details related to the kidnapping of the 20-month-old son of aviator Charles Lindbergh, an event that took place in 1932 in the United States and attracted an immense amount of publicity. Murray and Wheeler (1937) solicited dream accounts in the press and analyzed the cases they received for evidence of specific details that became known after the kidnapping. The authors reported that about 5% of the dreams mentioned the baby was dead "and only seven dreams ... suggested the actual location of the body, its nakedness and the manner of its burial" (p. 310). The authors, who were aware that their methodology did not control for elaboration of information after the details of the kidnapping were known, were disappointed with the low number of dreams providing veridical details. They concluded: "The findings do not support the contention that distant events and dreams are causally related" (p. 313).

In the United States Louisa E. Rhine discussed dream cases as part of her analyses of ESP experiences, most of which had been sent to J.B. Rhine or to the Parapsychology Laboratory then in existence at Duke University. She noticed that experiencers showed less conviction in the experience if they took place in dreams, as compared to waking experiences (Rhine, 1951). She also classified cases as realistic and unrealistic (symbolic) dreams (Rhine, 1953) and noticed that dreams were more likely to convey precognitive information than such waking experiences as intuitions and hallucinations and that of the dreams submitted this was especially

true of realistic dreams (Rhine, 1954). Another observation was that "in both types of dreams, realistic and unrealistic, one would look in vain for an internal distinction, between those of psi and those of non-psi nature. Thus it seems that psi converts itself into a conscious experience by utilizing methods already well known in psychology and in common experience" (Rhine, 1953, p. 109).

Two researchers introduced a methodological innovation, the recording of the precognitive dreams of two ladies before the dreams were fulfilled, finding some encouraging results (Dommeyer, 1955; Marabini, 1956). Both researchers also documented symbolic aspects in the dreams. Marabini studied an Italian 34-year-old midwife. In his work he deviated from previous case studies in that he paid more attention to the personal, medical and psychological history of this person. According to Marabini psychological tests did not reveal any intellectual or emotional abnormality. He was able to determine that this lady lived in a family environment open to the idea of psychic experiences: "As a child she loved sitting on the knees of the father when he told her of his past life. The most beautiful stories were always those in which there was talk of strange things that happened to the father; for example the dreams that he had and that 'came true', or the stories of 'spirits' in which the father believed firmly and comfortably" (p. iv).

Concluding Remarks

The material discussed here presents some clear trends about empirical interest in ESP in dreams prior to 1960. As we have seen there has been a long tradition of criticism surrounding the evidence for the existence of psychic dreams. The writings of Delage (1891), Macnish (1834), Maury (1861), Simon (1888), and Symmonds (1851) provide examples of this. The critical tradition has informed the evolution of the analysis of such cases. This was particularly the case in the discussions of evidentiality in Gurney Myers and Podmore's Phantasms of the Living (1886), in which the issue was examined by the presentation of an unprecedented detail along with the discussion of "best cases" in the evidential sense. All cases that were included were first hand, while most of the previous literature included many summaries of cases that were not narrated by

the experiencers. All corroborating testimony was included. This style of case reporting both improved the evidence for dream ESP considerably as well as inspired later work, such as the studies conducted by psychiatrist Ian Stevenson (1961, 1992), among others (e.g., Beloff, 1973).

An important lesson of the history of the investigation of seemingly psychic dreams is that some of the best criticisms, and most of the attempts to deal with them in the empirical analysis of cases, came from psychical researchers and not from "outside" skeptics. Regardless of the common sense or validity of the points raised by "outside" critics, very few of them conducted research themselves.

Although there were a few attempts to induce ESP dreams in the period of history I have covered, it is clear that before the Maimonides studies there was no experimental research tradition on the subject as such. But there were many observations and analyses of cases, some of them focusing on single cases and others on case collections. Most of these works were simple reports of cases designed to present evidence for ESP. Phantasms of the Living differed from that tradition because while the study documented the existence of evidence for coincidental dreams it also included dream features. Unfortunately little work was conducted in which dream ESP was studied in terms of interactions with other variables, nor there many attempts to understand more about the experiencers, with the exception of the work of Flournoy (1905) and Marabini (1956). One other exception was the attempt to explore dream and non-dream ESP in relation to conviction about the experience (Rhine, 1951).

The period I have covered was clearly one of qualitative analyses. The only early attempt to use quantification appeared in Phantasms of the Living, in which analyses of the issue of chance were presented. In addition some presented the prevalence of certain characteristics as percentages (e.g., Rhine, 1953; Saltmarsh, 1934). This type of description was then in evidence in more general studies of seemingly ESP experiences.

Later researchers, whose work was published from the 1960s forward continued the type of work discussed here. Although beyond the scope of this paper, I will mention that this later work included reports of single dream cases (e.g., Beloff, 1973; Bender, 1966; Hearne,1982; Stevenson, 1961; Tart, 1964) as well as analyses of groups of cases (e.g., Barker, 1967;

Rhine, 1962; Schredl, Götz & Ehrhardt-Knudsen, 2010; Schreiver, 1987; Stevenson, 1992). Furthermore, a question about ESP dreams has been included in some recent surveys (e.g., Alvarado & Zingrone, 2007-2008; Kohr, 1980; Palmer, 1979; Prasad & Stevenson, 1968).

These, and later developments, have brought experimental approaches and systematic study of psychological variables to dream ESP research. The shift was to be expected as parapsychology evolved methodologically and followed psychology proper as it develop a new interest in the study of consciousness.

References

Alvarado, C. S. (1998). ESP and altered states of consciousness: An overview of conceptual and research trends. Journal of Parapsychology, 62, 27-63.

Alvarado, C.S. (2002). Dissociation in Britain during the late nineteenth century: The Society for Psychical Research, 1882-1900. Journal of Trauma and Dissociation, 3, 9-33.

Alvarado, C.S., & Zingrone, N.L. (2007-2008). Interrelationships of psychic experiences, dream recall and lucid dreams in a survey with Spanish participants. Imagination, Cognition and Personality, 27, 63-69.

Apuleius. (1853). The works of Apuleius. London: H.G. Bohn.

Aristotle. (1902). Aristotle's psychology (W.A. Hammond, trans.). London: Swan Sonnenschein.

Aubrey, J. (1721). Miscellanies, upon the following subjects (2nd ed.). London: A. Bettesworth and J. Battley.

Barker, J.C. (1967). Premonitions of the Aberfan disaster. Journal of the Society for Psychical Research, 44, 169-181.

Barrett, W.F., Massey, C.C., Moses, W.S., Podmore, F., Gurney, E., & Myers, F.W.H. (1882). Report of the Literary Committee. Proceedings of the Society for Psychical Research, 1, 116-155.

Beloff, J. (1973). A note on an ostensibly precognitive dream. Journal of the Society for Psychical Research, 47, 217-121.

Bender, H. (1966). The Gotenhafen case of correspondence between dreams and future events: A study of motivation. International Journal of Neuropsychiatry, 2, 398-407.

Besterman, T. (1933). Report of inquiry into precognitive dreams. Proceedings of the Society for Psychical Research, 41, 186-204.

Biondi, M. (1988). Tavoli e medium: Storia dello spiritismo in Italia. Rome: Gremese.

Bjarnason, A. (1915). An Icelandic seer (edited by H. de G. Verrall). Journal of the Society for Psychical Research, 17, 53-76.

Bouché-Leclercq, A. (1879). Histoire de la divination dans l'antiquité (Vol. 1). Paris: Ernest Leroux.

Bozzano, R. (1905). A veridical dream: Telepathy or telaesthesia? Annals of Psychical Science, 2, 383-384.

Bozzano, E. (1907). Symbolism and metapsychical phenomena. Annals of Psychical Science, 6, 235-259, 335-366.

Bozzano, E. (1913). Des phénomènes prémonitoires. Paris: Annales des Sciences Psychiques.

Brierre de Boismont, A. (1855). History of dreams, visions, apparitions, ecstasy, magnetism, and somnambulism (1st American from 2nd French ed.). Philadelphia: Lindsay and Blakiston.

Calkins, M.W. (1893). Statistics of dreams. American Journal of Psychology, 5, 311-343.

Cardeña, E., & Alvarado, C.S. (2011). Altered consciousness from the age of Enlightenment through mid-20th century. In E. Cardeña & M. Winkelman (Eds.), Altering consciousness: Multidisciplinary perspectives: Vol. 1: History, culture and the humanities (pp. 89-112). Santa Barbara, CA: Praeger.

Case: Precognitive dream. (1947). Journal of the Society for Psychical Research, 34, 21-22.

Child, I.L. (1985). Psychology and anomalous observations: The question of ESP in dreams. American Psychologist, 40, 1219–1230.

A child's life saved by a dream. (1869). Spiritual Magazine, 4(n.s.), 134.

Cicero, M.T. (1853). The treatises of Cicero (C.D. Yonge, trans.). London: Henry Murray.

Circular No. 2 (Third edition). On dreaming and allied states. (1883). Proceedings of the Society for Psychical Research, 1, 303-305.

Cottrell, C.H. (1853). A very recent and remarkable clairvoyant dream. Zoist, 11, 79-80.

Crowe, C. (1848). The night-side of nature; or, ghosts and ghost seers (2 Vols.). London: T.C. Newby.

Daim, W. (1953). Studies in dream telepathy. Tomorrow, 2, 35-48.

Davey, Dr. (1850). Instance of clairvoyance during sleep. Zoist, 8, 328-329.

Delage, Y. (1891). Essai sur la théorie du rêve. Revue Scientifique, 48, 40-48.

de Pablos, F. (1998). Spontaneous precognition during dreams: Analysis of a one-year naturalistic study. Journal of the Society for Psychical Research, 62, 423–433.

de Sanctis, S. (1899). I sogni: Studi psicologici e clinici di un alienista. Turin: Fratelli Bocca.

Devereux, G. (Ed.). (1953). Psychoanalysis and the occult. New York: International University Press.

De Witt, A. (1897). Sogno premonitorio. Archivio di Psiquiatria, Scienze Penali ed Antropologie Criminale per Servire allo Studio dell'Uomo Alienato e Delinquente, 18, 268-269.

Dommeyer, F.C. (1955). Some ostensibly precognitive dreams. Journal of the American Society for Psychical Research, 40, 109-117.

Dream.--Coincidental. (1907). Journal of the American Society for Psychical Research, 1, 361-363.

Dunne, J.W. (1927). An experiment with time. London, A. & C. Black.

du Prel, C. (1907). La magie: Science naturele: I: La physique magique. Liege: H. Vaillant-Carmanne. (Original work published 1899)

Egidi, F. (1949). Sogni nell'antichità classica. Luce e Ombra, 49, 3-25, 67-82.

Ehrenwald, J. (1950). Presumptively telepathic incidents during analysis. Psychiatric Quarterly, 24, 726-43.

Eisenbud, J. (1948). Analysis of presumptively telepathic dream. Psychiatric Quarterly, 22, 103-35.

Ermacora, G.B. (1895). Telepathic dreams experimentally induced. Proceedings of the Society for Psychical Research, 11, 235-308.

Ermacora, G.B. (1898). La telepatia. Padua: L. Crescini.

Flammarion, C. (1900). L'inconnu: The unknown. New York: Harper & Brothers.

Flournoy, T. (1905). Note sur un sogne prophétique réalisé. Archives de Psychologie, 4, 58-72.

Fodor, N. (1942). Telepathic dreams. American Imago, 3, 61-85.

Freud, S. (1922). Dreams and telepathy. International Journal of Psycho-Analysis, 3, 283-305.

Freud, S. (1953a). The occult significance of dreams. In G. Devereux (Ed.), Psychoanalysis and the occult (pp. 87-90). New York: International University Press. (Original work published 1925)

Freud, S. (1953b). Dreams and the occult. In G. Devereux (Ed.), Psychoanalysis and the occult (pp. 91-109). New York: International University Press. (Original work published 1933)

Gauld, A. (1968). The founders of psychical research. London: Routledge & Kegan Paul.

Gregory, W. (1851). Letters to a candid inquirer, on animal magnetism. Philadephia: Blanchard and Lea.

Grensted, L.W. (1950). A paranormal dream? Journal of the Society for Psychical Research, 35, 339-341.

Gurney, E., Myers, F.W.H., & Podmore, F. (1886). Phantasms of the living (2 vols.). London: Trübner.

Halliday, W.R. (1913). Greek divination: A study of its methods and principles. London: Macmillan.

Hart, H., & Hart, E.B. (1933).Visions and apparitions collectivelly and reciprocally perceived. Proceedings of the Society for Psychical Research, 41, 205-249.

Hearne, K.M.T. (1982). An ostensible precognition of the accidental sinking of

H.M. submarine Artemis in 1971. Journal of the Society for Psychical Research, 51, 283-287.

Hill, J.A. (1918). Man is a spirit: A collection of spontaneous cases of dream, vision and ecstasy. New York: George H. Doran.

Holowchak, M.A. (2002). Ancient science and dreams: Oneirology in Greco-Roman antiquity. Lanham, MD: University Press of America.

Honorton, C. (1977). Psi and internal attention states. In B. B.Wolman (Ed.), Handbook of Parapsychology (pp. 435-472). New York: Van Nostrand Reinhold.

Iamblichos (1911). Theurgia or the Egyptian mysteries (A. Wilder, trans.). New York: Metaphysical Publishing.

Incidents: A symbolic and apparently premonitory dream. (1911). Journal of the American Society for Psychical research, 5, 369-370.

Inglis, B. (1989). Trance: A natural history of altered states of mind. London: Grafton.

James, T. (1995). Dream, creativity, and madness in nineteenth-century France. Oxford: Oxford University Press.

Jung-Stilling, J.H. (1851). Theory of pneumatology; in reply to the question, What ought to be believed or disbelieved concerning presentiments, visions, and apparitions, according to nature, reason and scripture (1st American ed). New York: J.S. Redfield. (Original work published, 1808)

Kelly, E.F., & Locke, R.G. (2009). Altered states of consciousness and psi: An historical survey and research prospectus (Parapsychological Monographs No. 18) (2nd ed.). New York: Parapsychology Foundation.

Kohr, R. L. (1980). A survey of PSI experiences among members of a special population. Journal of the Amercian Society for Psychical Research, 74, 395-411.

Kooy, J.M.J. (1934). Introspectief onderzoek naar het Dunne-effect. Tijdschrift voor Parapsychologie, 6, 144-169.

Krippner, S. (1970). Electrophysiological studies of ESP in dreams: Sex differences in seventy-four telepathy sessions. Journal of the American Society for Psychical Research, 64, 277- 285.

Krippner, S. (1991). An experimental approach to the anomalous dream. In J. Gackenbach & A.A. Sheikh (Eds.), Dream images: A call to mental arms (pp. 31-54). Amityville, NY: Baywood Publishing.

Krippner, S. (2007). Anomalous experiences and dreams. In D. Barrett & P. McNamara (Eds.), The new science of dreaming (Vol. 2, pp. 285-306). Westport, CT: Praeger.

Krippner, S., Ullman, M., and Honorton, C. (1971). A precognitive dream study with a single subject. Journal of the American Society for Psychical Research, 65,192-203.

Levi Bianchini, M. (1946). Sogno metafisico: Psicobiofi sica e mesencefalo. Metapsichica, 1(1), 28–45.

Levi Bianchini, M. (1950). Ulteriori contributi al problema dei sogni metapsichici e della psicobiofisica. Metapsichica, 5(4), 23–35.

Luke, D. (2011). Anomalous phenomena, psi, and altered consciousness. In E. Cardeña & M. Winkelman (Eds.), Altering consciousness: Multidisciplinary perspectives: Vol. 2: Biological and psychological perspectives (pp. 355-374). Santa Barbara, CA: Praeger.

Macario, M. (1857). Du sommeil: Des rêves et du somnambulisme dans l'état de santé et de maladie. Lyon: Perisse Frères.

Macnish, R. (1834). The philosophy of sleep (1st American ed.). New York: D. Appleton.

Marabini, E. (1956). Sogno Paragnosico (Contributo casistico). Minerva Medica, 47 (Supplement), II-XII.

Marulli, G. (1953). Il sogno telepatico di Giuseppina Perlasco: Contributo alla documentazione dei fenomeni metapsichici. Rivista di Psicopatologia, Neuropsichiatria e Psicoanalisi, 21, 419–422.

Maury, L.F.A. (1860). La magie et l'astrologie dans l'antiquité et au Moyen Age: ou étude sur les superstitions païennes qui se sont pérpetuées jusqu'au nos jours. Paris: Didier.

Maury, L.F.A. (1861). Le sommeil et les rêves: Études psychologiques sur ces phénomènes et les et les divers états qui s'y rattachent. Paris: Didier.

Mayo, H. (1851). On the truths contained in popular superstitions with an account of mesmerism (3rd ed.). Edinburgh: William Blackwood and Sons.

Miller, P.C. (1994). Dreams in late antiquity: Studies in the imagination of a culture. Princeton: Princeton University Press.

Monroe, J.W. (2008). Laboratories of faith: Mesmerism, spiritism, and occultism in modern France. Ithaca: Cornell University Press.

Moore, R. L. (1977). In search of white crows: Spiritualism, parapsychology, and American culture. New York: Oxford University Press.

Murray, H.A., & Wheeler, D.R. (1937). A note on the possible clairvoyance of dreams. Journal of Psychology, 3, 309-313.

Myers, F. W. H. (1892a). The subliminal consciousness: Chapter IV: Hypermnesic dreams. Proceedings of the Society for Psychical Research, 8, 362-404.

Myers, F. W. H. (1892b). The subliminal consciousness: Chapter V: Sensory automatism and induced hallucinations. Proceedings of the Society for Psychical Research, 8, 436-535.

Newbold, W.R. (1901). Cases: P. 266. Dream. Journal of the Society for Psychical Research, 10, 22-24.

Oppenheim, J. (1985). The other world: Spiritualism and psychical research in England, 1850 1914. Cambridge: Cambridge University Press.

Owen, R.D. (1860). Footfalls on the boundary of another world. Philadelphia: Lippincott.

Palmer, J. (1979). A community mail survey of psychic experiences. Journal of the American Society for Psychical Research, 73, 221-251.

Parker, A. (1975). States of mind: ESP and states of consciousness. New York: Taplinger.

Paulhan, F. (1892). Un cas de télépathie ou de lucidité dans le réve. Annales des Sciences Psychiques, 2, 2-4.

Pick, D., & Roper, L. (Eds.). (2004). Dreams and history: The interpretation of dreams from ancient Greece to modern psychoanalysis. New York: Brunner-Routledge.

Prasad, J, & Stevenson, I. (1968). A survey of spontaneous psychical experiences in school children of Uttar Pradesh, India. International Journal of Parapsychology, 10, 241-261.

Prince, W.F. (1918). Four dreams. Journal of the American Society for Psychical Research, 12, 395-403.

Prince, W.F. (1919). Some coincidental dreams. Journal of the American Society for Psychical Research, 13, 61-93, 172-182.

Prince, W.F. (1921).Analysis of the results of an old questionnaire. Journal of the American Society for Psychical Research, 15, 169-184.

Prince, W.F. (1922). Dreams seeming, or interpreted, to indicate death. Journal of the American Society for Psychical Research, 16, 164-189.

Rhine, L.E. (1951). Conviction and associated conditions in spontaneous cases. Journal of Parapsychology, 15, 164-191.

Rhine, L.E. (1953). Subjective forms of spontaneous psi experiences. Journal of Parapsychology, 17, 77–114.

Rhine, L. E. (1954). Frequency and types of experience in spontaneous precognition. Journal of Parapsychology, 18, 93-123.

Rhine, L.E. (1962). Psychological processes in ESP experiences: Part II. Dreams. Journal of Parapsychology, 26, 172-199.

Roffe, A. (1848). Clairvoyance in a dream. Zoist, 6, 54-56.

Rogers, L.W. (1916). Dreams and premonitions. Los Angeles, CA: Theosophical Book Concern.

Royce, J. (1889). Report of the Committee on Phantasms and Presentiments. Proceedings of the American Society for Psychical Research, 1, 350-528.

Saltmarsh, H. F. (1934). Report on cases of apparent precognition. Proceedings of the Society for Psychical Research, 42, 49-103.

Schredl, M., Götz, S., & Ehrhardt-Knudsen, S. (2010). Precognitive dreams: A pilot diary study. Journal of the Society for Psychical Research, 74, 168-175.

Schriever, F. (1987). A 30-year "experiment with time:" Evaluation of an individual case study of precognitive dreams. European Journal of Parapsychology, 7, 49-72.

Servadio, E. (1956). A presumptively telepathic-precognitive dream during analysis. International Journal of Psycho-Analysis, 36, 27-30.

Shapin, B., & Coly, L. (1978). (Eds.). Psi and altered states of awareness. New York: Parapsychology Foundation.

Sherwood, S. J., & Roe, C. A. (2003). A review of dream ESP studies conducted since the Maimonides dream ESP programme. Journal of Consciousness Studies, 10, 85-109.

Shipley, M.F. (1908). A record of dreams and other coincidental experiences (comments by J.H. Hyslop). Proceedings of the American Society for Psychical Research, 2, 454-535.

Sidgwick, E. (1889). On the evidence for premonitions. Proceedings of the Society for Psychical Research, 5, 288-354.

Sluhovsky, M. (2011). Spirit possession and other alterations of consciousness in the Christian Western tradition. In E. Cardeña & M. Winkelman (Eds.), Altering consciousness: Multidisciplinary perspectives: Vol. 1: History, culture and the humanities (pp. 73-88). Santa Barbara, CA: Praeger.

Simon, P. M. (1888). Le monde des rêves (2nd ed.). Paris: J.B. Baillière et Fils.

Smith, D.L. (2002). Occult, and Freud. In E. Erwin (Ed.), The Freud Encyclopedia: Theory, therapy, and culture (pp. 395-397). New York: Routledge.

Sondow, N. (1988). The decline of precognized events with the passage of time: Evidence from spontanous dreams. Journal of the American Society for Psychical Research, 82, 33-51.

Stekel, W. (1920). Der Telepathische Traum. Berlin: Johannes Baum.

Stevenson, I. (1961). An example illustrating the criteria and characteristics of precognitive dreams. Journal of the American Society for Psychical Research, 55, 98-103.

Stevenson, I. (1992). A series of possibly paranormal recurrent dreams. Journal of Scientific Exploration, 6, 281–289.

Symmonds, J.A. (1851). Sleep and dreams. London: John Murray.

Tart, C.T. (1964). A possible "psychic" dream. Journal of the Society for Psychical Research, 42, 283-99.

Tavera, M. (2000). Le rêve naturel: Physiologie de l'onirisme au XVIIIe siècle. Gesnerus, 57, 5-26.

Taves, A. (1999). Fits, trances, & visions: Experiencing religion and explaining experience from Wesley to James. Princeton, N.J. : Princeton University Press

Ullman, M., & Krippner, S. (1969). A laboratory approach to the nocturnal dimension of paranormal experience: Report of a confirmatory study using the REM monitoring technique. Biological Psychiatry, 2, 259-270.

Ullman, M., & Krippner, S. (1970). Dream studies and telepathy (Parapsychological Monographs No. 12). New York: Parapsychological Foundation.

Ullman, M., Krippner, S., & Feldstein, S. (1966). Experimentally induced telepathic dreams: Two studies using EEG-REM monitoring. International Journal of Neuropsychiatry, 2, 420-437.

Ullman, M., Krippner, S., with Vaughn, A. (2001). Dream telepathy: Scientific experiments in nocturnal extrasensory perception (3rd ed.). Charlottesville, VA : Hampton Roads.

Ustinova, Y. (2011). Consciousness alteration practices in the West from prehistory to late antiquity. In E. Cardeña & M. Winkelman (Eds.), Altering consciousness: Multidisciplinary perspectives: Vol. 1: History, culture and the humanities (pp. 45-72). Santa Barbara, CA: Praeger.

Van de Castle, R.L. (1977). Sleep and dreams. In B. B. Wolman (Ed.), Handbook of parapsychology (pp. 473-489). New York: Van Nostrand Reinhold.

Van de Kemp, H. (1981). The dream periodical literature: 1860-1910. Journal of the History of the Behavioral Sciences, 17, 88-113.

Verrall, H. de G. (1915). An Icelandic seer: Further comments on professor Bjarnason's report. Journal of the Society for Psychical Research, 17, 78-82.

Vesme, C. (1901). A propos de rêves premonitoires et de paramnésie. Revue des Études Psychiques, 1, 225-242, 331-350, 361-371.

Wallace, W. (1878, September 13). A remarkable dream or vision. Medium and Daybreak, p. 583.

Warcollier, R. (1908). Rêve symbolique prémonitoire. Annales des Sciences Psychiques, 18, 81-83.

Warcollier, R. (1921). La télépathie: Recherches expérimentales. Paris: Félix Alcan.

Warning dream, and trance. (1849). Univercoleum and Spiritual Philosopher, 4, 23.

Weed, S.C., Hallam, F.M., with the assitance of Phinney, E.D. (1895). Minor studies from the psychological laboratory of Wellesley College: III. A study of the dream consciousness. American Journal of Psychology, 7, 405-411.

Wesermann, H.M. (1820). Versuche willkührlicher Traumbildung. Archives für den Thierischen Magnetismus, 6, 135-142.

Wolffram, H. (2009). The stepchildren of science: Psychical research and parapsychology in Germany, c. 1870-1939. Amsterdam: Rodopi.

Xenophon. (1847). The anabiosis (vol. 2). New York: Harper & Brothers.

SPONTANEOUS PSI DREAMS: LOUISA E. RHINE'S STUDIES REVISITED

Sally Rhine Feather *

Introduction

After almost two decades of experimental research seeking evidence for various types of psi phenomena, in 1948 the Parapsychology Lab at Duke University undertook its first qualitative study of spontaneous psi reports. The Duke Case Study Project was a departure in methodology from its own laboratory procedures as well as representing a dramatic shift from the earlier proof-oriented studies of case material of that era, most notably from those of the British Society for Psychical Research.

As outlined in an 1948 Editorial in the Journal of Parapsychology, my father J.B. Rhine explained that the purpose of the Case Project was to obtain as inclusive a picture as possible of how psi might occur in the natural setting in order to obtain suggestions that could then be validated in the laboratory. He wrote, "It is one of the most urgent needs of our research field that we turn back to these natural springs of research ideas and draw upon them to the fullest extent." In actuality, as my mother Louisa E. Rhine (LER) got more involved in this study of which she became project director, the purpose of the study broadened, as she noted in a 1970 publication, "The continued study of the material permitted a more fundamental concept of the psi process than I could have anticipated."

The history of how LER came to take ownership of this Project is as follows. In 1948, as a self-described experimentalist, she had just returned to full-time work at the Duke Lab after years of child-raising, although she had conducted or collaborated with several parapsychological experiments during those earlier years. But when in 1948 it appeared that no other Lab researcher was available to take on this case project, LER

* Rhine Research Center, Durham, NC, USA.

accepted the task because she realized that it needed to be done. She had neither a background nor special interest in the experiential side of the field, although her doctorate training as a botanist undoubtedly helped in the basic classification task that was an essential factor in this new study.

It is a paradox that what started out as a small project taken on without much expectation of success, would develop into LER's life work and become the largest collection and study of spontaneous psi experiences ever conducted, ending with well over 12,000 cases at the time of the project's conclusion in 1971 and 15,000 cases by the time of her official retirement in 1980. It is also a paradox that LER's work is probably more often cited today than any of the other research findings of the early Duke Parapsychology Lab.

Methodology

The methodology of LER's case study was based on the original objective to obtain suggestions for laboratory study. Contrary to earlier proof-oriented case studies, this was planned to be a "wide-net" effort in order to gather as much information as possible about how psi is reported in everyday life. As such, it was to be based on large numbers of predominantly unselected case reports with far less stringent criteria of selection.

All reports were to be accepted with or without supplementary investigation if they appeared on face value to provide extrasensory information (i.e. to have occurred without information from the known senses or from inferences based thereof) and if they appeared to be submitted "in good faith and by apparently sane individuals." Her rationale was that in a sizeable collection of uninvestigated cases accepted in this fashion, that the elements of unreliability would be random "noise" that would wash out across categories, leaving indication of reliable and consistent data on the characteristics and occurrence of psi experiences. The intention was to have at least 50 cases in any separate category upon which any real credence would be placed.

LER began her program with 300 cases already on hand that had been sent unsolicited to the Duke Lab, but the collection grew steadily during the subsequent years and was occasionally supplemented by short articles she wrote for popular magazines of the day. As it was, as noted in

a footnote (The Intimate Picture, p.36), she notes reading a large number of postal letters from which far less than half contained suitable cases. The general procedure was for her to mark the cases that were then copied by a secretary, then to be coded and organized by LER by alone, there being no available assistants.

There has been some controversy about LER's methods, usually from individuals who are not aware of her general purpose, or of the fact that each study relied upon very large numbers. But despite her growing appreciation of spontaneous psi reports as she read thousands of them, LER always remained cautious about her conclusions. She insisted on limiting her findings to simple charts and percentages, stating that "the use of statistical methods on samples collected as these necessarily were would obviously be of very limited value and could easily introduce a seeming, but false, accuracy" and she added "since the entire objective of the survey is to obtain suggestions for experimentation, rather than to prove any point."

In reviewing her work, most parapsychologists would agree to a number of caveats inherent in a case study of this kind such as:

• Authenticity issues that could come from a variety of reporting errors, i.e. better recall of waking than of dreaming experiences.

• Reliability issues inherent in categorizing, especially of borderline cases, by one researcher working alone.

• Sampling issues – i.e. articles often in women's magazines.

• Lack of independence across the variety of findings.

However, as will be described later, there has been enough corroboration of LER's findings from later independent case studies to provide reasonable confidence in her methods and findings.

General findings

LER's anecdotal, theoretical and statistical studies based on her large case collection were reported in many publications, spanning several decades. The present report is limited to those seven studies that seem relevant to psi in the dream state or how psi dreams compare with other forms of psi reports. These seven studies were each based on samples of from nearly 1000 to over 4000 cases, and were conducted about every two or three years between 1950 and 197l as more cases were accumulated.

To conceptualize her findings, LER adopted a two-stage model of psi developed by British psychical researcher G.N.W. Tyrrell (1946). In Stage I it was assumed that the experiencer (somehow) receives correct and complete information about an event that later will be psychically perceived, while in Stage II the information is then brought to consciousness in some form, likely that common in ordinary dreaming or waking intuition. State II is the stage where the information is basically corrupted, blocked, or altered, in ways suggesting these distortions are ascribable to psychological influences.

1. Form of Experience: The best-known of LER's findings pertain to the four forms of psi experiences that emerge in the Stage II process, into which she felt the cases seemed to naturally sort themselves. As Harvey Irwin notes (2007), these have generally been endorsed by most or all other case analysts who have used similar classificatory systems.

A major finding of this case study is that the majority of the reports, almost two-thirds, were of dreams with accompanying imagery. But in the overall collection there were two forms of dream experience and two forms noted in waking experiences. The four major forms of the reported experiences are as follows:

(1) Realistic dreams were the most common form of PSI experience, with 44% of LER's cases in this form that appeared as if providing a more or less literal or accurate portrayal of the confirming event. Typical would be a mother's dream that her son was in a fiery car crash on the night before the actual crash occurs, with the essential imagery being duplicated in the event.

(2) Unrealistic dreams were reported in about 21% of the reports, and contained predominant fantasy or symbolic elements and yet with information enough that could logically be linked with a later event, For instance, the woman in the last example might dream that her son hands her a single rose and then begins walking into a dark cave.

(3) Intuitive experiences that occurred in a waking state were reported in 26% of the cases. These intuitive cases involve a sense of foreboding or "hunch" that something has occurred. These are imageless impressions that seem to "come out of the blue." They provide few details, sometimes just an inexplicable emotion or a compulsion to act. For instance, a woman

may be driving to work and be overcome with a sense of foreboding that something is wrong at home. She turns her car around and drives back to her house, only to find it on fire, her toddler and babysitter huddled on the front lawn.

(4) Hallucinations, also occurring in the waking state, comprised about 9% of the cases, and these could be visual, auditory or "telesomatic." Hallucinations mimic genuine sensory experiences, although the percipient is often unaware that what they are seeing or hearing was a hallucination until later. A man writes to tell me that his grandmother "appeared" to him on the patio in her favorite dress, scaring two little dogs, and then was found to have died in her bed at about that time in a far distant part of the large house.

There were two smaller groups not included here – one a "wastebasket" category of "indeterminate" cases with mixed features, and the other a small group of 179 unexplained physical events that occurred at a time that suggested a meaningful connection – i.e. clock that stopped when grandfather died. (This so-called psychokinetic category is currently being studied at the Rhine Center but was not well-represented in the LER collection, and is outside the scope of a presentation about psi dreams.)

2. Type of Experience: One finding that is fairly consistent across case studies is that the majority of dream reports tend to be precognitive, (i.e. to involve the apparent paranormal perception of future events), whereas the large majority of the waking experiences including intuitive and hallucinatory cases seem more often to refer to contemporaneous events. This is particularly interesting in that there does not appear to be any conscious clue available to the experiencer at the time of the dream that would suggest the timing of the perceived experience.

3. Completeness of Information: A psi experience was considered to be "complete" if it provided information about an event and who was affected or involved. In a large majority of the cases (72%) both the event and the target person were identified but this varied a great deal over the four basic forms of the experience. It was highest for the realistic dreams (91%) followed by unrealistic dreams (72%), intuitive impressions (55%) and hallucinatory experiences (32%). This of course reflects the fact that

dream reports are generally rich in detail as compared to other forms. One less obvious finding is the higher rate of incomplete information noted in experiences that pertain to an upcoming death as compared to those pertaining to other serious topics or to generally mundane topics.

4. Relationships and Contents of Experience: The majority of psi experiences tend to be on critical, highly emotion-stirring and usually negative topics, and the vast majority of cases relate to human concerns as compared to material ones (i.e. deaths, serious accidents, births, marriages, etc.) again consistently across collections of others, to the point that it seems more than a reporting artifact. Why not more dreams about house fires, financial disasters, or winning the lottery?

The majority of psi reports that were not about one's self were about those who were emotionally close to the experiencer - and this has been repeatedly confirmed in other case collections as well as corroborated in lab studies.

The type of experiential content varies according to the relationship, so that psi dreams about close friends and family members were more apt to be about death or serious accidents in contrast to the less serious topics for dreams reported about one's self. Dream reports about deaths of a family member or friend tended to be precognitive, whereas reports of less serious content of close relationships tended to be contemporaneous.

5. Conviction about Experience: Early in her work LER made a concerted effort to look at the issue of "conviction", since the question had arisen from the experimental situation as to why so few of the high-scoring subjects seemed to be aware of the success of their lab performance calls. In contrast, a sample of 1600 reports from the case collection (36%) indicated by the words or actions of the reporters that they believed the experience was valid before they knew the outcome. This "conviction" varied substantially according to the form of the experience. With the highest level of belief found among those reporting waking intuitions or hunches (84%), as compared to the dream form where only 23% of those with realistic dreams and 19% of those reporting unrealistic dreams were taking these seriously at the time of the dream. There was a striking discrepancy between how reports from waking states showed

conviction as compared to reports from dream states.; 70% of the waking as compared to 30% in the dreaming state. This suggests that the form of how the experiencer obtains and later reports the psi information is much more compelling to him about its authenticity than how much information is consciously conveyed by the experience itself.

Summary of findings

(1) Psi dreams tend to be of the precognitive type even though the dreamer has no obvious way of knowing at the time whether this is a dream of the future or of the immediate present.

(2) Psi dreams tend to bring a fairly complete picture of what is to occur (to whom and in what way) and often in great detail, in considerable contrast to how psi is reported in other forms.

(3) Psi dreams are reported most often about one's self than others although these are often of trivial matters. Next in frequency are psi dreams about closely related family members, with much fewer dreams reported about casual acquaintances or strangers.

(4) The content of psi dreams is very likely to be negative or unpleasant, only a small percentage about positive or neutral topics. An exception to this would be déjà vu experiences that if psychic are more likely to be about neutral landscapes.

(5) Psi dreams are more often ignored, forgotten, or not taken seriously at the time of the experience in sharp contrast to waking intuitions or the less frequent hallucinatory form of psi reports, the latter typically reported as a waking vision, voice or a somatic sensation.

Ian Stevenson's approach

In his 1970 book Telepathic Impressions, the psychiatrist and reincarnation expert Ian Stevenson makes a passionate case for the value of authentication of selected cases both as compelling evidence of psi occurrence and as offering valuable psychological information. He reports a careful and detailed study of 35 cases of what he calls telepathic impressions, that would be roughly comparable to LER's intuitions - all waking cases that are devoid of imagery. While there are still ongoing

arguments about his first point, it does seem clear that a psychological in-depth look at individual cases as Stevenson presented could be a helpful supplement to the experimental evidence and to studies such as LER's, with informative clues as to how psi operates particularly by someone with his psychodynamic perspective. It is worthy of note that despite Stevenson and LER's differences over the use of unselected versus authenticated cases, that Stevenson's findings are generally considered to coincide well with LER's as they relate to this intuitive form of experience.

Sybo Schouten's approach

The most extensive follow-up of LER's studies was a series of computer analyses of samples from various case studies that was conducted in the early 1980's by the Dutch psychologist Sybo Schouten at the University of Utrecht. Starting from a "pragmatic approach" without predisposition about the existence of psi, Schouten reports approaching an analysis of reported psi experiences as he assumes would any psychologist attempting to understand human experience. He expected that if there were no psi involved that there would be major cultural differences in reports collected across different times and cultures. To test this expectation, he made a comparison study of three large samples selected from the Phantasms collection by the SPR in the late 19th century, the Sannwald collection from Germany's IGPP in the mid-1950's, and LER's collection from the United States from 1950 to the early 70's.

Schouten scored each case with respect to 32 categories of information (i.e. sex & age of percipient, type of experience, seriousness of event), then looked at the results from these three studies separately and then in comparison.

The results of Schouten's studies suggest a high degree of consistency among the psi reports collected during these different periods from different populations and by different methods. In the Journal of Parapsychology (1983) he states that "LER's unselected cases have the same characteristics as the very carefully selected cases from the Phantasms collection (p. 333)." Furthermore, he found that the lesser corroborated cases within the Phantasms collection showed the same characteristics as those that were highly corroborated, which suggests that the level

of reliability of the cases hardly influences the data. "The significant quantitative differences are a minor portion of the findings while the qualitative agreement is almost total," according to Joseph Rush (1986, Foundations of Parapsychology).

Summary of LER's contribution

From her nearly 30 years research on spontaneous psi reports, LER was able to bring some order and legitimacy to the study of this complicated topic, as well as carry on the tradition of the early SPR pioneers on this topic. Her contributions include: (1) providing a basic classificatory system for psi experiences that is widely used by others, obtaining useful suggestions for later research including a broadening of methodology, both at the Duke Lab and elsewhere such as the Maimonides dream studies, (3) detecting helpful clues about the psi process, the agency of psi information, the inevitability of predictions, the meaningfulness of the information, and information about psi in the dream state, and (4) bringing major awareness and supportive information to the general public, particularly at a time when there were few reliable sources of information.

LER summarized her case study research in her final book on case material, The Invisible Picture published in 1971, and now republished in 2011. One later book entitled Something Hidden gave the story of her & JB's life that she completed shortly before her death at age 91 in 1983.

Case studies today

Modern research methodology and technology have greatly expanded and simplified ways of studying spontaneous cases since LER's time. A current example is the qualitative study initiated several years ago at the Rhine Center by Christine Simmonds-Moore Ph.D. and myself to gain a deeper understanding of spontaneous psychokinesis (PK) experiences, or "anomalous physical phenomena," as they occur to people in the real world.

Although spontaneous PK experiences have been documented in all periods of recorded history, this type of report was rarely reported to LER or other case collectors of her time, and little attention has been given

to collecting or systematically studying them until now (Irwin & Watt, 2007). Pam Heath's phenomenological study of PK experiences is a notable exception, but she focused on people who were regular PK experiencers and those who had done well in lab experiments exploring PK rather than the accounts of ordinary people from in the general population.

After a review of the case literature on PK, we initiated an online call for reports of unexplained physical occurrences that met the definition of spontaneous psychokinesis. A sub-set of these respondents were then selected for intensive interviews, either face-to-face or by telephone, with questions that covered a variety of areas including states of consciousness, mood, diet, sleep patterns associated with the experience, their own conceptualisation of the nature of PK, and so on. The interview data were then subjected to a qualitative analysis (utilizing grounded theory and transpersonal methods) to extract significant emergent themes, and these themes were used to develop a multi-dimensional questionnaire. This includes PK experiences which were felt to originate from an internal source and those which were felt to originate from an external source.

The Rhine Unusual Physical Experiences Questionnaire (soon to be published) has emerged from this process. Data have been subjected to item analysis, reliability analysis, factor analysis and cluster analysis of responses and validation by correlation with an existing PK measure. From analysis of pilot data (a subject pool of 78 PK experiencers), the scale seems to comprise five subscales, reflecting different forms of PK experience. These include Electrophysical PK, Discarnate or External PK (EPK), Controllable PK, Emotional PK and Healing. EPK, for example, comprises several items pertaining to messages from discarnate sources/ the universe, "apports" and other death-related physical phenomena.

In addition, an exploratory cluster analysis suggested that there are actually different types of PK respondents. One type scored higher on external PK, feeling in control of PK experiences and healing PK. We consider that a systematic exploration of the correlates of different types of PK experiences is warranted.

We are currently undergoing further testing of the questionnaire to see if these patterns hold up in a larger sample (those on the mailing list of the Rhine Center). This questionnaire will later be used to explore the correlations between personality and mental health variables and the

varieties of PK experiences among members of the general population. And eventually it will be available to other researchers.

We consider this methodology to be an appropriate one to apply more broadly to the wide range of psi experiences reported by the general population. This would be taking LER's findings to the next step, and perhaps be instructive in learning more about how psi is experienced in the dream state.

References

Alvarado, S. and Zingrone, N.L. (2008) Ian Stevenson and the modern study of spontaneous ESP experiences, *Journal of Scientific Exploration*, 22, 44-53.

Irwin, H.J. and Watt, C. (2007) An Introduction to Parapsychology 5th Edition. Jefferson, NC: McFarland.

Rhine, J.B. (1948) The value of reports on spontaneous psi experiences. *Journal of Parapsychology,* 12, 231-235.

Rhine, L.E. (1981) The Invisible Picture: A Study of Psychic Experiences,
Jefferson, NC: McFarland.

Rhine, L.E. (1951) Conviction and associated conditions in spontaneous cases. *Journal of Parapsychology*, 15, 164-191.

Rhine. L.E. (1953) Subjective forms of spontaneous psi experiences. *Journal of Parapsychology*, 17, 77-114.

Rhine. L.E. (1954) Frequency of types of experience in spontaneous precognition. *Journal of Parapsychology*, 18, 93-123.

Rhine, L.E. (1962) Psychological processes in ESP experiences. Part I. Waking experiences. *Journal of Parapsychology,* 26, 88-111.

Rhine, L.E. (1963) Psychological processes in ESP experiences. Part II. Dreams, *Journal of Parapsychology,* 27, 172-199.

Rhine, L.E. (1964) Factors influencing the range of information in ESP experiences. *Journal of Parapsychology,* 28, 176-213.

Rhine, L.E. (1965) Comparison of subject matter of intuitive and realistic ESP experiences. *Journal of Parapsychology*, 29, 996-108.

Rhine, L.E. (1978) The psi process in spontaneous cases. *Journal of Parapsychology*, 42, 20-32.

Rush, J.H. in H.L. Edge, Morris, R.L., Palmer, J. & Rush, J.H. (Eds.), (1986) Foundations of Parapsychology, London: *Routledge & Kegan Paul*.

Schouten, S.A. (1983) A different approach for analyzing spontaneous cases with particular reference to the study of Louisa E. Rhine's case collection. J*ournal of Parapsychology,* 47. 323-340.

Schouten, S.A. A different approach for analyzing spontaneous cases with particular reference to the study of Louisa E. Rhine's case collection, in K.R. Rao (1986) Case Studies in Parapsychology, *Jefferson, NC: McFarland*.

Stevenson, Ian (1970) Telepathic Impression: A Review and Report of 35 New Cases. Charlottesville: *Univ.Pres of Virginia*.

Weiner, D.H. & Haight, JM. Charting hidden channels, in K.R.Rao (1986) Case Studies in Parapsychology, *Jefferson, NC: McFarland*.

WHAT HAVE WE LEARNED FROM EXPERIMENTAL TESTS OF DREAM ESP?

Christopher A. Roe *

Abstract

Approximately two thirds of all reported spontaneous cases of extrasensory perception (ESP) occur while the experient was in an altered state of consciousness, particularly while dreaming (Rhine, 1962). Early experimental attempts at the Maimonides sleep laboratory to elicit ESP by monitoring participants and waking them during REM sleep were remarkably successful, with an overall hit rate after 450 trials of 63% (where MCE = 50%) that has odds against chance of 75 million to one (Radin, 1997, p. 72). Attempts to replicate this promising finding have been limited by the prohibitive costs of maintaining a sleep laboratory and difficulties in recruiting participants for studies that require them to stay overnight. However, some researchers have continued to investigate dream ESP using cheaper and less labour-intensive methods. In this presentation I outline some of the methods adopted by teams working post-Maimonides and consider recent reviews of this database (Roe & Sherwood, 2009; Sherwood & Roe, 2003) to draw conclusions as to whether an effect has been demonstrated. I will pay particular attention to conceptual and methodological weakness in later replications and make recommendations for future work.

Introduction

An experience of 'extrasensory perception' can be defined as "one in which it appears that the experient's mind has acquired information directly, that is, seemingly without the mediation of the recognized human senses or the processes of logical inference" (Irwin & Watt,

* Psychology Division, The University of Northampton, UK.

2007, p. 5). Despite scientific scepticism about such phenomena, the general public tends to believe that they can occur and frequently claim to have had personal experience of them. For example, a MORI poll of a representative sample of UK residents ('Paranormal survey', 1998) found that 54% believed in premonitions/ESP and 25% believed that dreams could predict the future. A primary driver of belief seems to be personal experience: of those that responded affirmatively, 48% claimed to have personal experience of ESP and 58% reported having had a dream that later came true. A later poll by the same organisation for The Sun newspaper ('Three in five', 2003) found that 64% believed in premonitions/ESP and 30% believed that dreams could predict the future; of these, the proportion reporting personal experience of these phenomena was 41% and 42% respectively.

As part of their effort to understand this phenomenon, a number of researchers have collected spontaneous cases of ESP, and analysis of these cases suggests that ESP is most likely to occur when the percipient's awareness is shifted away from the outside world, with dreams predominating (e.g., Barker, 1967; Dunne, 1927; Hearne, 1989; Feather & Schmicker, 2005; Rhine, 1981; Sannwald, 1963; Schouten, 1981; Sondow, 1988; Steinkamp, 2000).

Rhine (1981) found that dream ESP experiences were much more likely to be precognitive (that is, to refer to events that would only take place in the future) than contemporaneous (reported by 75% and 40% of the sample respectively). Experients also reported that such dreams felt different from 'ordinary' dreams in being particularly portentous or imbued with meaning (Barker, 1967; Dunne, 1927), such that they might actively attempt to prevent the precognised events from occurring or become increasingly agitated until the precognition was confirmed (see, for example, Hearne, 1989, p. 13). The events also tended to involve others who were emotionally close rather than mere acquaintances or famous people (Steinkamp, 2000), were of important often negative events (Schouten, 1981; Steinkamp, 2000), although they could be trivial (Orme, 1974; Sondow, 1988), and could elicit a sense of déjà vu when witnessing the confirming event (Sondow, 1988; Steinkamp, 2000). These are the characteristics of dream ESP that would need to be accounted for in any explanatory model.

While case collections and surveys are useful in identifying characteristics of a phenomenon (e.g. in terms of necessary or sufficient conditions) they are less useful as evidence that the experience has an anomalous cause. This is because we don't have sufficient control over the factors that might have conveyed information normally. Morris (1986, especially §4.4 to 4.6, pp. 86-97) offers a useful summary of the normal explanations we need to consider. Most obviously, we have no basis for how to assess the likelihood that the experience is simply a coincidence; to quote Vasiliev (1965, cited in Ullman & Krippner with Vaughan, 1989, p. 9):

Prophetic dreams are more often founded on misunderstanding. Nearly everyone has dreams, sometimes many dreams in one night. In a week, a month, a person accumulates tens, if not hundreds of dreams. Do many of them materialize? Of course not. Dreams as a rule do not materialize; only in exceptional circumstances do they coincide, more or less, with future events. According to the theory of probability this is as it should be: many dreams, many events - some of them must inevitably coincide. There is nothing wonderful in this.

Thus, if there are 11 million residents in Portugal, each of whom has 3-5 dreams each night, should we not expect to see a 30-million-to-1 coincidence between one of those dreams and a later unusual event just by chance? This objection may be weakened a little by the finding, noted above, that percipients often are aware that this particular dream has a sense of importance or meaning that sets it apart from common or garden variety dreams, so that such basic calculations may be inappropriate, but it nevertheless draws attention to the fact that we have no clear way of determining how likely the observed correspondences between dream and confirming event were just by chance. This problem is exacerbated by the nature of collecting cases, which are typically solicited by national appeals (e.g., Barker, 1967; Hearne, 1989) or are based on correspondence received by research centres that are known nationally or internationally for their work (e.g. Feather & Schmicker, 2005; Rhine, 1981), and so may reflect a relatively small response from a very broad sampling frame. Such reports may therefore give the impression that very rare occurrences are quite common.

Other difficulties in interpreting testimony about dream ESP cases reflect concerns that adequate barriers might not be in place to preclude

normal communication (see Figure 1). If we begin at the bottom of the Figure, it may be that the dream and confirming event share a common antecedent that is responsible for the apparent similarities. For example, one might hear an old song on the radio one evening that is recalled later on during sleep and goes on to evoke memories of one's schooldays, playing out in the form of a dream about a particular friend whom one hasn't seen for years. The very next day that friend calls out of the blue as a result of a chain of associations they had in response to hearing that same song. In presenting and evaluating the case, it is unlikely that the ultimate cause would be recalled. It is also possible that barriers are inadequate during the experience, particularly where one is asleep and might not recognise that, for example, one's dream has incorporated information from a news bulletin on a clock radio that reports on a national disaster. We finally need to ensure that accounts of the experience and of the confirming event are not contaminated by knowledge of one another; recall is susceptible to distortion in ways that fit with expectation and wider knowledge (Bartlett, 1932) so that reports of the dream will naturally converge with what is known of the confirming event. Likewise perception of the confirming event will be directed by expectations that result from knowledge of the dream. For this reason Lambert (1965) included among his desiderata for a case to be of interest as evidence of ESP that the dream should be reported to a credible witness before the occurrence of the confirming event. It would also be desirable for an account of the confirming event to be produced by someone who at that point is blind to the content of the dream.

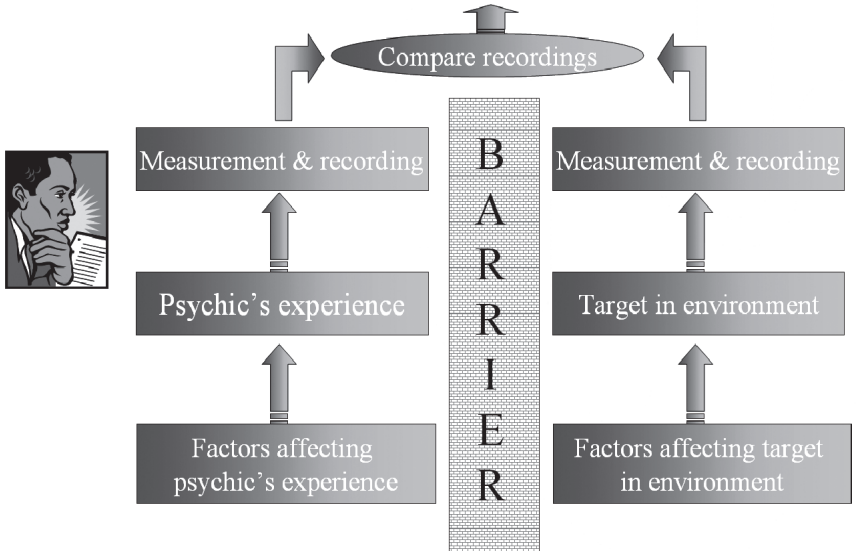

Figure 1. The stages at which normal communication may be possible (after Morris, 1986).

Of course, in practice the conditions that Lambert calls for are rarely met and are more likely to be satisfied through experimentation that allows for the shortcomings identified above to be addressed systematically. It is possible with experimental work to control for selective reporting by pre-specifying the number of participants, sessions and session length. Targets and decoys can be selected in such a way as to produce an unequivocal estimate of the probability of achieving the observed degree of correspondence. Randomisation can ensure that participants cannot take advantage of natural biases or use inference. Clear barriers can be put in place to preclude normal communication from target to percipient. Real-time recording of impressions can prevent recall errors. And outcomes can be quantified in a manner that enables the results to be analysed statistically.

These features are to be found in the programme of research conducted at the Maimonides sleep laboratory, New York, from 1962 to 1978 under the direction of Montague Ullman and Stanley Krippner (cf. Ullman et al., 1989). Participants slept at the laboratory and their EEG-EOG was monitored to identify when they were in REM sleep (and so

were more likely to report a dream if woken). After the participant was securely in the sleep laboratory, elsewhere in the building a target was randomly selected from among a set art prints. A member of laboratory personnel designated to be sender for that night retired to another sound-attenuated room in the building and attempted to 'send' information about the target by telepathy. The participant was woken during dream periods and asked to report on their experience. In the morning they were presented with twelve pictures consisting of a copy of the target and eleven decoys, which were given confidence ratings and also placed in rank order according to their similarity to the dream mentation, to give data that could be compared with chance expectation.

The Maimonides programme consisted of a number of different procedural variations to give a total of 13 formal dream ESP studies and 3 pilot series. Space does not permit us to discuss those variations (see Roe & Sherwood for a more detailed account), but the results of these experiments are given in Table 1. Sherwood and Roe (2003) calculated effect sizes for the study outcomes (included in Table 1) so that they could be combined to give an overall weighted effect size and to compare results from different study types. This summary statistic gives an effect size, r, of 0.34 that is highly significant (95% confidence interval = 0.24 to 0.43), indicating that under these controlled conditions participants were still able to use their dream mentation to identify the target from among a set of decoys to a degree that was well above chance expectation.

We saw above that precognition has been particularly common in dream ESP cases. Consistent with this, in the Maimonides series those studies that focused on precognition (two formal experiments and one pilot study) were most successful, giving a mean weighted effect size of r = 0.67 (95% CI = .16 to .90), albeit from a total of just 18 trials. For comparison, the 11 telepathy series (two formal experiments and one pilot study) gave r = 0.32 (95% CI = .21 to .41), and the sole clairvoyance study gave a comparable effect size of r = 0.35. Given these confidence intervals we must, however, conclude that the three types of ESP do not give rise to significantly different effect sizes.

Table 1. Results for the Maimonides dream ESP studies.

	STUDY	TYPE OF ESP	TRIALS	TEST STATISTIC	EFFECT SIZE R
A	Ullman, Krippner, & Feldstein (1966) study 1 - 1st screening	Telepathy	12	z = 0.71	0.21
B	Ullman, Krippner, & Feldstein (1966) study 2 - 1st Erwin study	Telepathy	7	z = 2.53	0.96
C	Ullman (1969) - 2nd screening	Telepathy	12	z = -0.25	-0.07
D	Ullman (1969) - Posin study	Telepathy	8	z = 1.05	0.37
E	Ullman, Krippner, & Vaughan (1973) - Grayeb study	Telepathy	8	z = -0.63	-0.22
F	Ullman & Krippner (1969) - 2nd Erwin study	Telepathy	8	t = 4.93	0.88
G	Krippner & Ullman (1970) - Van de Castle	Telepathy	8	t = 2.81	0.73
H	Pilot sessions	Telepathy	67	z = 4.20	0.51
I	Krippner, Ullman & Honorton (1971) - 1st Bessent study	Precognition	8	t = 2.81	0.73
J	Krippner, Honorton, & Ullman (1972) - 2nd Bessent study	Precognition	8	t = 2.27	0.65
K	Pilot sessions	Precognition	2	z = 0.67	0.47
L	Krippner, Honorton, Ullman, Masters, & Houston (1971) - Sensory bombardment study	Telepathy	8	z = 3.11	1.10
M	Krippner, Honorton, & Ullman (1973) - Grateful Dead study	Telepathy	12	z = 0.61	0.18
N	Pilot sessions	Clairvoyance	8	z = 0.98	0.35
O	Honorton, Krippner, & Ullman (1972) - Vaughan, Harris, & Parise	Telepathy	203	z = 0.63	0.04

Some attempts were made by similarly equipped sleep laboratories to replicate the findings reported by the Maimonides laboratory (e.g., Belvedere & Foulkes, 1971; Globus, Knapp, Skinner, & Healy, 1968; Strauch, 1970), but these were unsuccessful. Sherwood and Roe (2003) summarise methodological criticisms of these studies that could have contributed to their failure.

Most replication attempts have not used a sleep laboratory and EEG-EOG monitoring, reflecting the prohibitive costs of maintaining such a laboratory given the meagre resources available to parapsychology, and so should be classed as conceptual replications. Sherwood and Roe (2003) identified 26 formal reports of such dream ESP studies published between 1977 and 2002, of which 21 were amenable to mathematical review. Methodologies varied widely, though typically involved participants sleeping at their own home and keeping a dream diary after giving themselves the suggestion that they would recall their dreams and these would enable then to identify an unknown target image or video clip. Unlike the Maimonides series which focused mainly on telepathy, less than half of the post-Maimonides studies did so; the majority investigated clairvoyance, which is methodologically simpler in that it does not require a sender and so rules out some channels of conventional communication.

The outcomes of these 21 studies are given in Table 2. When the study effect sizes are combined this gives a weighted mean r of 0.14, which again deviates significantly from the null value of zero (95% CI = 0.06 to 0.22). However, these results are significantly less successful than the post-Maimonides studies ($t[34] = 2.14$, $p = 0.04$, two-tailed). Contrary to the Maimonides studies, the precognitive experiments were least successful and did not deviate from chance ($r = -.09$, 95% CI = -.44 to .29), while telepathy and clairvoyance trials were independently significant (respectively, $r = .24$, 95% CI = .06 to .39; and $r = .36$, 95% CI = .24 to .47).

Table 2. Results for the Post-Maimonides dream ESP studies.

	STUDY	TYPE OF ESP	TRIALS	TEST STATISTIC	EFFECT SIZE R
1	Braud (1977) Pilot	Telepathy	50	z = -1.90	-0.27
2	Braud (1977) Experiment 1	Telepathy	30	z = 1.29	0.16
	Braud (1977) Experiment 2	Telepathy	36		
3	Child, et al. (1977) Experiment 1	Telepathy	8	t = 1.87	0.58
4	Child, et al. (1977) Experiment 2	Telepathy	5	t = 2.69	0.80
5	Kanthamani, et al. (1988) Pilot	Clairvoyance	10	t = 0.75	0.24
6	Kanthamani & Khilji (1990)	Clairvoyance	20	t = 1.79	0.38
7	Kanthamani & Broughton (1992)	Clairvoyance	40 (20)	t = 3.52	0.63
8	Hearne (1981b)	Telepathy	---	F = 0.00	0.00
9	Hearne (1987)	Telepathy	8	z = -0.39a	-0.14
10	Hearne (1989)	Telepathy	10	z = 0.31	0.10
11	Weiner and McCain (1981)	Clairvoyance	12	t = 2.30	0.57
12	Sargent & Harley (1982)	Precognition	20	z = 0.30a	0.07
13	Harley (1989)	Clairvoyance	20	t = -2.45	-0.49
14	Markwick & Beloff (1983)	Clair/Telep.	100	z = 1.87a	0.18
15	Markwick & Beloff (1988)	Clair/Precog.	100	z = -0.39	-0.04
16	Dalton, et al. (1999)	Clairvoyance	32	z = 3.58	0.63
17	Sherwood, et al. (2000)	Clairvoyance	28	z = 1.44	0.27
18	Dalton, et al. (2000)	Clairvoyance	16	z = 2.35a	0.59
19	Roe, et al. (2002)	Clairvoyance	31	z = 0.80	0.14
20	Sherwood, et al. (2002)	Precognition	12	z = -1.16	-0.34
21	Eppinger (2001)	Clairvoyance	50	z = -0.07	-0.01

Results for the post-Maimonides studies may have been inferior overall because they failed to include psi-conducive elements of the original protocol. The most obvious candidates for elements to be included are: pre-screening participants for suitability (the worst Maimonides studies were the screening studies involving unselected participants); monitoring for REM sleep and awakening participants during these periods when they were most likely to recall a dream (it is not uncommon for a participant to have recalled no dreams from their experimental night); inclusion of additional information in judging process (Maimonides participants were encouraged to report personal associations as well as a literal description of their dreams); the use of blind judges who were experienced at evaluating dream mentations; and the inclusion of emotional and vivid target material. Clearly some post-Maimonides studies included at least some of these features, but they have not been implemented in a programmatic fashion. It would be interesting to see how success co-varies with the occurrence of these elements.

What, then, have we learned from experimental tests of dream ESP? The results to date suggest that it is possible to produce above-chance scoring under circumstances that control for the normal explanations that have been offered to account for spontaneous experiences. There seems good evidence that an anomaly has been established that warrants further investigation. Differences in effects sizes between Maimonides and Post-Maimonides databases seem to reflect the omission of psi-conducive elements rather than the eradication of artifacts by methodological improvements. Further work should therefore be designed so as to build on good practice as identified in the previous paragraph. It should also become more process oriented - rather than simply providing yet more evidence that an ESP-like effect occurs, researchers need to systematically manipulate variables so as to identify necessary or sufficient conditions, or patterns of performance that could shed light on mechanism. Most promising in this respect would be a focus on situational, participant and participant-experimenter interaction variables. If this challenge is taken up by the parapsychological community then a review of dream ESP research after another 10 years is likely to prove much more insightful concerning the nature of ESP.

References

Barker, J.C. (1967). Premonitions of the Aberfan disaster. J*ournal of the Society for Psychical Research,* 44, 169-180.

Bartlett, F.C. (1932). Remembering: A Study in Experimental and Social Psychology. Cambridge: *Cambridge University Press.*

Belvedere, E.. & Foulkes, D. (1971). Telepathy and dreams: *A failure to replicate, Perceptual and Motor Skills*, 33, 783-789.

Dunne, J.W. (1927/2005). An experiment with time. *New York: Macmillan.*

Feather, S.F., & Schmicker, M. (2005). The gift: Extraordinary paranormal experiences of ordinary people. London: *Rider.*

Globus, G., Knapp, P. H., Skinner, J. C., & Healey, G. (1968). An appraisal of telepathic communication in dreams. *Psychophysiology,* 4, 365.

Hearne, K. (1989). Visions of the future. Wellingborough, UK: Aquarian Press.

Irwin, H. J., & Watt, C. A. (2007). An introduction to parapsychology (5th ed.). Jefferson, NC: *McFarland.*

Lambert, G.W. (1965). A precognitive dream about a water spout. *Journal of the Society for Psychical Research*, 43, 5-10.

Morris, R. L. (1986). What psi is not: The necessity for experiments. In H. L. Edge, R. L. Morris, J. Palmer, & J. H. Rush, Foundations of parapsychology: Exploring the boundaries of human capability (pp. 70-110). London: Routledge & Kegan Paul.

Orme, J.E. (1974). Precognition and time. *Journal of the Society for Psychical Research*, 47, 351-365.

'Paranormal Survey' (1998) Thursday 05 February 1998. *From http://www.ipsos-mori.com/content/polls-1998/paranormal-survey.ashx accessed* 9 Feb 2009.

Radin, D. (1997). The conscious universe: The scientific truth of psychic phenomena. New York: *Harper Collins.*

Rhine, L. E. (1962). Psychological processes in ESP experiences. Part I. Dreams. *Journal of Parapsychology*, 27, 172-199.

Rhine, L. E. (1981). The invisible picture: A study of psychic experiences. *Jefferson, NC: McFarland*.

Roe, C.A., & Sherwood, S.J. (2009). Evidence for extrasensory perception in dream content: A review of experimental studies. In S. Krippner (Ed.), Perchance to Dream: The Frontiers of Dream Psychology. *Nova Science Publishers Inc.*

Sannwald, G. (1963). On the psychology of spontaneous paranormal phenomena. *International Journal of Parapsychology*, 5, 274-292.

Schouten, S. (1981). Analysing spontaneous cases: A replication based on the Sannwald collection. *European Journal of Parapsychology,* 4, 9-48.

Sherwood, S. J., & Roe, C. A. (2003). A review of dream ESP studies conducted since the Maimonides dream ESP programme. *Journal of Consciousness Studies*, 10, 85-109.

Sondow, N. (1988). The decline of precognized events with the passage of time: Evidence from spontaneous dreams. *Journal of the American Society for Psychical Research*, 82, 33-52.

Steinkamp, F. (2000). Acting on the future: A survey of precognitive experiences. *Journal of the American Society for Psychical Research*, 94, 37-59.

Strauch, I. (1970). Dreams and psi in the laboratory. In R. Cavanna (Ed.), Psi favorable states of consciousness (pp. 46-54). New York: Parapsychology Foundation.

Three In Five 'Believe In God'. (2003). *http://www.ipsos-mori.com/research publications/researcharchive/772/ Accessed June* 2 2012.

Ullman, M., & Krippner, S. with Vaughan, A. (1989). Dream telepathy: Experiments in nocturnal ESP (2nd ed.). *Jefferson, NC: McFarland*.

THE PSYCHOLOGY OF PRECOGNITIVE DREAM EXPERIENCES

Caroline Watt *

Abstract

This presentation reviews research into the four principal psychological processes that have been proposed as possible contributory factors in precognitive dream experiences: probability misjudgement; propensity to find correspondences; selective recall; implicit knowledge. Only a small amount of this research has been directly applied to precognitive dreams, though relevant research has explored many of these hypothesised processes with relation to paranormal beliefs and experiences more generally. The presentation also considers the wider implications of the study of the psychology of precognitive dream experiences.

Introduction

Precognition – literally fore-knowing – has been described in accounts of prophetic dreams from the earliest writings of humankind. Representative surveys show that around one quarter of the population believes in the ability to foretell the future (Moore, 2005). Attempts to systematically document and collect such cases confirm that between one-third to two-thirds of ESP experiences occur during dreams (e.g., Gurney, Myers & Podmore, 1886; Rhine, 1954; Van de Castle, 1977). Dreams seem to play a particularly important role in precognitive experiences. For instance, in 1957 the UK Society for Psychical Research received approximately 1,500 letters describing spontaneous paranormal experiences in response to a popular article. Three hundred of these were judged worthy of analysis, and of the 103 cases apparently involving precognition, 64 occurred during dreams and ten during "borderland sleep" (presumably involving hypnagogic and hypnopompic imagery) –

* Koestler Parapsychology Unit, University of Edinburgh, UK. I am grateful to the Perrott-Warrick Fund for supporting my research into precognitive dream experiences.

72%. Death is a predominant theme in precognitive dreams, followed by accident and injury, and percipients are predominantly female (e.g., Green, 1960; Saltmarsh, 1934), though reporting bias may account for both of these trends. A review of the various surveys of spontaneous GESP experiences concludes that, if only precognitive cases are considered, around 60% involve dreams, with a further 10% involving "borderland" states (Van de Castle, 1977). Therefore, the vast majority of spontaneous precognitive experiences involve dreams or sleep-related states.

The three principal mechanisms that may underlie precognitive dream experiences are: anomalous cognition, coincidence, and psychological processes. These are not mutually exclusive, therefore they are difficult to disentangle in real-world reports of precognitive dream experiences. As we've heard from the previous speakers in this session, coincidence and normal psychological processes can be controlled for in laboratory dream-ESP studies. Lab studies are therefore the place to look when considering the question of the evidence for anomalous cognition in dreams, and this body of research has been reviewed by my co-presenters Carlos Alvarado and Chris Roe.

Psychological processes hypothesised to contribute to precognitive dream experiences

Given the variable findings of laboratory dream-ESP research compared to the frequency with which precognitive dream experiences are reported outside of the lab, it seems reasonable to assume that normal psychological processes may contribute to at least some of these spontaneous experiences, in the same way as psychological factors unavoidably contribute to our experiences in general (Schmeidler, 1988).

This presentation briefly reviews the four principal psychological processes that have been proposed as possible contributory factors in precognitive dream experiences: probability misjudgement; propensity to find correspondences; selective recall; implicit knowledge. Only a small amount of this research has been directly applied to precognitive dreams, though relevant research has explored many of these hypothesised processes with relation to paranormal beliefs and experiences more generally (French & Wilson, 2007).

1. Probability misjudgement

Blagrove, French and Jones (2006) explored the hypothesised link between poor probabilistic reasoning and precognitive dream experiences and beliefs. They administered questionnaire measures of participants' experience and belief in precognitive dreams. Participants also completed two probabilistic reasoning tasks, one to do with throwing dice, and one with lottery playing. There was no relationship between precognitive belief/experience and performance on the dice task. Precognitive belief and experience was found to correlate with relatively poor performance on the lottery task. However, when the analysis was repeated with a sub-sample of university-educated participants, no relationship was found. Therefore level of education is a variable that moderates the relationship between precognitive dream experiences, beliefs, and performance on probabilistic reasoning tasks.

Overall, the research on the relationship between paranormal beliefs and probabilistic reasoning does not present a consistent picture (Irwin & Watt, 2007), and this suggests that other factors are more influential in producing paranormal beliefs and experiences. This is the conclusion that Bressan (2002) also came to. Bressan looked at the relationship between coincidence experiences, paranormal belief, and performance on a battery of probabilistic reasoning tasks. Like Blagrove et al., Bressan found that believers tended to report more coincidences, and also made more probabilistic reasoning errors than disbelievers. However, again the effect was not found in a sub-sample of educated participants. Bressan (2002) concluded that a more frequent experience of coincidences, and a more biased representation of randomness, 'are independent consequences of a stronger propensity of believers in the paranormal to connect separate events' (p. 17). Indeed, it has been suggested that the research into inaccuracies in probability estimation is not in fact relevant to the question of paranormal beliefs and experiences because, when individuals have a greater propensity to see events as meaningfully related, their subjective experience will actually be of a greater number of coincidences (Bressan, 2002).

2. Propensity to find correspondences

In line with Bressan's conclusions, several researchers have observed a connection between a propensity to link unrelated events, and paranormal beliefs (e.g., Brugger, 1997; Brugger & Graves, 1997). For example, Fyfe and colleagues (2008) explored how performance on a battery of tasks indicative of apophenia (the tendency to perceive connections/meaning between unrelated events) and theory of mind (the ability to represent mental states in others) related to questionnaire measures of schizotypy. They found that schizotypal participants tended to perceive connections in the 'random' conditions, and tended to 'over-mentalize', that is construct over-elaborate accounts in the theory of mind tasks.

Brugger and colleagues have suggested that this propensity arises out of greater levels of right hemisphere activation, and a bias towards 'right hemisphere' processing, amongst paranormal believers (e.g., Brugger & Taylor, 2003). This propensity seems to be associated with an exaggeration of the normal tendencies to attribute meaning, rather than to a dysfunction in the ability to attribute causality. However, we should be wary of making over-simplistic 'right hemisphere vs left hemisphere' distinctions, and should note that some researchers have failed to replicate the claimed association between performance on functional asymmetry tasks and paranormal belief (Schulter & Papousek, 2008).

So far, none of this research has been explicitly linked to the experience of precognitive dreams. However, Brugger has noted that the ability to connect distantly-related events may be a factor in certain aspects of creative thinking, and in so-called 'healthy schizotypy'. Simmonds-Moore (2010) has reviewed research on the question of how paranormal belief and schizotypy may lead to an exaggerated tendency to make the 'Type I' error.

3. Selective recall

A small amount of work has focused on how selective recall may create the sense that one's dreams predict the future. One study presented students with a fake dream diary alongside a diary of significant events in the life of the supposed dreamer. The students were later asked to

recall as many of the dreams as they could, and it was found that a greater proportion of 'confirmed' dreams was remembered compared to 'unconfirmed' dreams. (Madey,1993, cited in Gilovich, 1997). As Gilovich (1997) points out, this outcome is to be expected because the fulfilment of a prophecy reminds one of the earlier prediction. The non-fulfilment presents no retrieval cue for memory of earlier dreams.

A second diary study examined the recall of temporally focused predictions (a date or specific time-frame is provided) versus unfocused predictions (no date/frame is provided) (Madey & Gilovich, 1993). An interaction was found whereby the memorability of the predictions was related to whether or not they were later confirmed. Confirmed predictions were readily recalled irrespective of their temporal focus. Disconfirmed predictions were only recalled when they concerned a temporally-focused event. Madey and Gilovich concluded that the heightened recall for confirmed prophesy-event pairs was due to them receiving greater attentional resources than disconfirmed pairs, and that the effect of temporal focus was to direct attention to either outcome (confirming or disconfirming). The study authors noted that given that most psychic predictions are not temporally focused, this process would again lead to the inflation of seemingly precognitive experiences, because disconfirmed predictions would rarely be recalled.

4. Implicit knowledge

Some researchers have suggested that an individual may mistakenly conclude they have had a paranormal experience when they have in fact extrapolated from weak sensory information (e.g., Wilson, 2002; Rensink, 2004). For instance, a driver may unconsciously detect a subtle change in the way that their vehicle is handling. This may lead to unconscious anxiety that becomes expressed via a dream in which the vehicle is involved in an accident. As the driver was not consciously aware of the change in the vehicle's performance, they conclude that their dream was precognitive.

There is some indirect evidence in support of this hypothesis. For instance, in the area of change blindness, it has been shown that if participants are presented with an alternating sequence of two images

that are largely but not completely identical, they can report a sense that something has changed even though they cannot identify what the change is (Rensink, 2004). Similarly, research by Damasio (1999) has shown that, when people play a card game in which there is a hidden rule that certain decks are more 'risky' than other decks, individuals can implicitly learn this rule and change the way that they play with the risky deck before they are able to explicitly say what the difference is between the decks.

Parapsychologist Michael Thalbourne has developed the concept of transliminality - the 'hypothesised tendency for psychological material to cross (trans) the threshold (limen) into or out of consciousness' (Thalbourne, 2000, p.31). Crawley, French and Yesson (2002) found a correlation between scores on a transliminality questionnaire and the number of hits on a computer-based ESP card guessing task when the right answer was subliminally 'primed'. There was no overall evidence for ESP, suggesting that the highly transliminal participants were responding to the implicitly-presented information. Using a signal detection analysis, Crawley and colleagues were able to demonstrate that the higher scoring of transliminal participants was due to heightened perceptual sensitivity, rather than to them adopting a looser response criterion.

Together, these studies demonstrate that individuals can respond to 'gut feelings' based on actual subtle changes in their environment, without being aware that they are doing so. It is possible that this mechanism contributes to some precognitive dream experiences.

Conclusions

Of the four psychological processes that have principally been proposed to account for some precognitive dream experiences, the evidence for one - probability misjudgements - is not compelling. There is some indirect evidence that implicit knowledge and propensity to find correspondences are factors that are likely to contribute to the experience of precognitive dreams, and more direct evidence exists for the role of selective recall in these experiences. Clearly there is plenty of scope for further research into these three types of psychological processes, and possibly others as yet unidentified, to develop a clearer understanding of how they may be associated with the experience of precognitive dreams.

Happily, I am currently engaged in a programme of research supported by the Perrott-Warrick Fund, specifically addressing these questions as well as the anomalous cognition hypothesis.

This presentation also seeks to reiterate the broader point made by Gertrude Schmeidler (1988), that there are many links to be found between the study of paranormal experiences and mainstream topics. Indeed research into paranormal experiences may positively contribute to our understanding of brain processes under stressful or extreme circumstances (e.g., Mobbs & Watt, 2011), as well as into psychological constructs such as creativity, schizotypy (and the 'healthy'/'unhealthy' distinction therein), empathy, and cognitive processes such as recall (including false memory and selective recall) and the processing of weak sensory information. This does not logically imply that there is no paranormal/anomalous component to these experiences, but does require us to accept that it is likely that psychological factors play an important role in them as well. As my former mentor Bob Morris knew so well, if parapsychologists can demonstrate to mainstream scientists that they are well aware of how 'normal' processes can contribute to paranormal experiences, the mainstream community is more likely to pay attention when parapsychologists claim evidence of paranormal processes.

References

Blagrove, M., French, C. C., & Jones, G. (2006). Probabilistic reasoning, affirmative bias and belief in precognitive dreams. *Applied Cognitive Psychology*, 20, 65-83.

Bressan, P. (2002). The connection between random sequences, everyday coincidences, and belief in the paranormal. *Applied Cognitive Psychology*, 16, 17-34.

Brugger, P. (1997). Variables that influence the generation of random sequences: An update. *Perceptual and Motor Skills*, 84, 627-661.

Brugger, P., & Graves, R. E. (1997). Testing vs believing hypotheses. Magical ideation in contingencies. *Cognitive Neuropsychiatry*, 2, 251-272.

Brugger, P., & Taylor, K. I. (2003). ESP: Extrasensory perception or an effect of subjective probability? *Journal of Consciousness Studies*, 10, 221-246.

Crawley, S. E., French, C. C., & Yesson, S. A. (2002). Evidence for transliminality from a subliminal card guessing task. *Perception*, 31, 887-892.

Damasio, A.R. (1999). The Feeling of What Happens. New York: *Harcourt-Brace & Company*.

French, C. C. & Wilson, K. (2007). Cognitive factors underlying paranormal

beliefs and experiences. In Della Salla, S. (Ed.) Tall Tales About the Mind and Brain. Oxford: *Oxford University Press*.

Fyfe, S., Williams, C., Mason, O. J., & Pickup, G. J. (2008). Apophenia, theory of mind and schizotypy: Perceiving meaning and intentionality in randomness. *Cortex*, 44, 1316-1325.

Gilovich, T. (1997). Some systematic biases of everyday judgement. *Skeptical Inquirer, March/April*, 31-35.

Green, C. E. (1960). Report on enquiry into spontaneous cases. *Proceedings of the Society for Psychical Research*, 53, 97-161.

Gurney, E., Myers, F. W H., and Podmore, F. (1886). Phantasms of the Living. London: *Trubner*. 2 vols.

Irwin, H. J. & Watt, C. (2007). An Introduction to Parapsychology 5th Edition. Jefferson, NC: *McFarland*.

Madey, S. F. (1993). Memory for expectancy-consistent and expectancy-inconsistent information: An investigation of one-sided and two-sided events. Unpublished Doctoral Dissertation, Cornell University. Cited by Gilovich, T. (1997). Some systematic biases of everyday judgement. Skeptical Inquirer, March/April, 31-35.

Madey, S. F., & Gilovich, T. (1993). Effect of temporal focus on the recall of expectancy-consistent and expectancy-inconsistent information. *Journal of Personality and Social Psychology*, 65, 458-468.

Moore, D. (2005). Three in four Americans believe in paranormal. *WWW Gallup news report accessed 22nd May* 2010.

Rensink, R. (2004). Visual sensing without seeing. *Psychological Science*, 15, 27-32.

Rhine, L. E. (1954). Frequency of types of experience in spontaneous precognition. *Journal of Parapsychology*, 18, 93-123.

Saltmarsh, H. F. (1934). Report on cases of apparent precognition. *Proceedings of the Society for Psychical Research*, 42, 49-103.

Schmeidler, G. R. (1988). Parapsychology and Psychology: Matches and Mismatches. New Jersey: *McFarland*.

Schulter, I. & Papousek, G. (2008). Believing in paranormal phenomena: relations to asymmetry of body and brain. *Cortex*, 44, 1326-1335.

Simmonds-Moore, C. (2010). Exploring how schizotypy and paranormal belief influence the tendency to make the Type I error and the detection of degraded and paranormal stimuli in random noise. Proceedings of the 53rd Annual Convention of the Parapsychological Association (pp. 39-40). P*aris, France, July* 22-25.

Thalbourne, M. (2000). Transliminality: *A review. International Journal of Parapsychology*, 11, 1-33.

Van de Castle, R. L. (1977). Sleep and dreams. In B. Wolman (Ed.) Handbook of Parapsychology (pp. 473-499). Jefferson, NC: *McFarland*.

Wilson, S. (2002). Psi, perception without awareness, and false recognition. *Journal of Parapsychology*, 66, 271-289.

WAKING LIFE AND DREAMING: HOW THEY INTERACT

Michael Schredl [*]

Abstract

Although research – as shown by selecting typical studies – has clearly demonstrated the continuity between waking and dreaming in both ways (waking → dreaming and dreaming → waking), a lot of questions are still unanswered. Future research should focus on possible factors like emotional involvement or personality factors affecting the continuity between waking and dreaming. In addition, it would be very desirable to intensify the research regarding the positive effects of dreaming on waking life like dreams stimulate creativity or help in self-understanding and therapy.

Keywords: dreaming, continuity hypothesis, creativity, emotions

First, a clear definition of dreaming will be given to clarify the subject of dream research. The following definition attempts to cover the consensus of the researchers in the field:

"A dream or a dream report is the recollection of mental activity which has occurred during sleep. (Schredl, 2008b, p. 12)"

It is important to notice that dreaming as a mental activity during sleep is not directly measurable, two boundaries have to be crossed (sleep-wake transition and time) before the person can report the subjective experiences which occurred during sleep. This leads to the problem of validity, i.e., is the dream report an appropriate account of the actual dream experience (see Schredl & Erlacher, 2003). The second question which has been raised by Maury (1861) is whether the dream report reflects mental activity during sleep or is merely produced during the awakening process. Modern research combining physiological approaches with dream content analysis, however, have been able to demonstrate that dream reports are accounts of mental activity during sleep since

[*] Central Institute of Mental Health, Mannheim, Germany.

physiological parameters (e.g., eye movements, heart rate) during REM sleep at least partially match with dream contents elicited upon awakening (Erlacher & Schredl, 2008). In addition, the incorporation of stimuli applied during sleep into dreams (Schredl, 1999; Strauch & Meier, 2004) corroborates the assumption that dreaming occurs during sleep.

Continuity hypothesis of dreaming

Many researchers are advocating the so-called "continuity hypothesis" of dreaming which simply states that dreams reflect waking-life experiences (Schredl, 2012). However, different researchers emphasized different aspects of waking in regard to the continuity, e.g., current concerns (Domhoff, 1996; Hall & Nordby, 1972), waking thoughts (Strauch & Meier, 1992), and waking life experiences in a broader sense (Schredl & Hofmann, 2003). In addition, for deriving specific hypotheses the continuity hypothesis in its general formulation is too imprecise. In order to advance the research in this field, Schredl (2003) postulated a mathematical model that is based on the published findings and seems to be promising for further empirical testing (see Figure 1). The multiplying factor includes the effects of emotional involvement (EI), type of the waking-life experience (TYPE) and the interaction between personality traits and incorporation rates (PERS). The relationships between these factors should be determined by future studies. The slope of the exponential function may be moderated by the time interval between sleep onset and dream onset (time of the night; TN).

Incorporation rate = a (EI, TYPE, PERS) * $e^{-b(TN)*t}$ + Constant	
a (EI, TYPE, PERS)	multiplying factor which is a function of emotional involvement (EI), type of the waking-life experience (TYPE) and the interaction between experience and personality traits (PERS)
b (TN)	Slope of the exponential function which is itself a function of the time interval between sleep onset and dream onset (TN)
t	Time interval between waking-life experience and occurrence of the dream incorporation

Figure 1. Mathematical model for the continuity between waking life and dreaming.

The following two studies on sports in dreams have been selected to demonstrate how the continuity between waking and dreaming can be studied. In the first study, 36 sport students (20 men, 16 women; age mean: 22.9 ± 3.2 yrs.) and 36 age- and gender-matched psychology students kept a dream diary over a two-week period. As expected, the psychology students reported more and longer dreams (see Table 1). The sport students, on the other hand, reported more sports dreams whether the dream includes some sport activity of the dreamer or more generally dream elements related to sport (Erlacher & Schredl, 2004). This finding clearly reflects that topics that are prominent in waking life show up in a relative direct way in dreams. In the follow-up study (Schredl & Erlacher, 2008), the amount of time spent with sport activities during the day directly correlated with the percentage of sports dreams of the participant (see Table 2). Moreover, there was still a significant difference between sport students and psychology students indicating that amount of time spent during the day is not the only variable explaining the occurrence of sport dreams, it might be assumed that sport topics are generally of more importance for sport students, e.g., issues around performance, than for psychology students and, thus, the percentage of sport dreams is increased. Interestingly, the same correlation between the amount of time spent with reading and the percentage of reading dreams were found for both groups (see Table 2). These two studies indicate that waking life is reflected in dreams. Research in other areas, e.g., dreaming in patients with mental disorders (Schredl, Riemann, & Berger, 2009) or patients with sleep disorders (Schredl, 2010) also support the continuity hypothesis of dreaming. For a more detailed review see Schredl (2003).

Table 1. Dreaming in sport students and psychology students (Erlacher & Schredl, 2004).

	Sport students (N = 36)	**Psychology students** (N = 36)	**Statistical test**
Number of dreams	2.75 ± 1.63	3.75 ± 1.30	t = 2.9; p = .0052 [1]
Amount of words	77.85 ± 94.45	151.25 ± 97.25	t = 3.3; p = .0018 [1]
Number of dreams with active participation in sport	0.72 ± 0.85	0.33 ± 0.53	F = 16.7; p = .0001 [2]
Number of dreams with sport themes	1.06 ± 1.04	0.53 ± 0.65	F = 24.0; p = <.0001 [2]

[1] t-test

[2] ANCOVA (factor: group (depicted); covariates: number of dreams, amount of words).

Table 2. Sport and reading dreams in sport and psychology students (Schredl & Erlacher, 2008).

Variable	Sport Dreams		Reading dreams	
	t	p	t	p
Time spent with corresponding waking activity (Sport/Reading)	2.7	<.01	3.0	<.01
Group (Sport students vs. Psychology students)	2.8	.01	1.0	.32
Gender	0.8	.42	-0.4	.72
Age	-0.2	.87	-1.0	.32
Dream recall frequency	3.2	<.01	1.0	.32
R squared	0.244		0.127	

Effects on dreams on waking

The second type of continuity designates the effects of dreams on subsequent waking life; a topic which has not studied in much detail compared to the research on the effect of waking life on dreaming. The most often reported effect of dreaming on waking is the effect of dreaming on day-time mood (Schredl, 2000a). In a large sample (N = 444), Schredl (2009) studied the effect of dream and personality variables on the frequency of dreams that affect daytime mood. Significant effects were found for dream recall frequency, attitude towards dreams, nightmare frequency, intensity of positive and negative dream emotions, introversion, and thin boundaries. It clearly makes sense that dream recall frequency and the emotional intensity (very high in nightmares) are related to the effect of dreams on daytime mood. Interestingly, introversion and thin boundaries were also related to frequency of dream effects; introverted persons might experience stronger effects regarding their dreams as do persons with thin boundaries (Schredl, 2009).

Another effect of dreams on waking can often be found in the literature: creative dreams, dreams that inspire the dreamer to do something in his or her waking life. Three different types can be differentiated: 1. Dream element transformed into art (Marc Chagall, Salvador Dali), 2. Dreams

that solve a problem (discovery of the benzene ring by August Kekulé), and 3. Dreams as impulse for waking-life activities (see example below). Other famous examples can be found in Barrett (2001), for example, Paul McCartney dreaming the melody of "Yesterday". The third type, dreams directly stimulating a waking action is illustrated by a dream of William Dement, a well-known sleep scientist.

"Some years ago I was a heavy cigarette smoker - up to two packs a day. Then one night I had an exceptionally vivid and realistic dream in which I had inoperable cancer of the lung. I remember as though it were yesterday looking at the ominous shadow in my chest X-ray and realizing that the entire right lung was infiltrated. The subsequent physical examination in which a colleague detected wide-spread metastases in my axiliary and inguinal lymph nodes was equally vivid. Finally, I experienced the incredible anguish of knowing my life was soon to end, that I would never see my children grow up. I will never forget the surprise joy, and exquisite relief of waking up. I felt I was reborn. Needless to say, the experience was sufficient to induce an immediate cessation of my cigarette habit. (Dement, 1974, p. 102)"

This example clearly demonstrates that there was no dream interpretation involved, the strong emotional experience during the dream caused an action in waking life. Given the large number of anecdotal reports of creative dreaming in exceptional artists in the literature, Schredl and Erlacher (2007) conducted a study of creative dreams in "normal" persons. The distribution of the frequency of dreams giving creative impulses for waking life is depicted in Table 3. Given the dream recall of 3.11 ± 2.32 mornings per week in this sample and the frequency of creative dreams of 1.05 ± 2.47 dreams per month, Schredl and Erlacher (2007) estimated that about 7.8% of all dream include some form of creativity used by the dreamer in his or her waking life. The major topics (obtained from the online subsample) are depicted in Table 4. The frequency of creative dreaming was correlated with dream recall frequency, thin boundaries, imagination, and positive attitude towards dreams (Schredl & Erlacher, 2007). It would be very interesting to study persons working in creative profession, for example, whether they can tap the creative potential of their dreams.

Table 3. Frequency of creative dreams Schredl & Erlacher, 2007).

Categories	Frequency	Relative frequency
never	308	28.6 %
less than once a year	169	15.7 %
about once a year	113	10.5 %
about 2 to 4 times a year	197	18.3 %
about once a month	96	8.9 %
about 2 to 3 times a month	101	9.4 %
about once a week	49	4.5 %
several times a week	43	4.0 %

Table 4. Themes of the creative effect of dreams on waking life (N = 272 responses).

Themes	Absolute Frequency
Creativity	
Painting	30
Literature/Writing	25
Music	5
Other (Web design, recipes, gifts)	24
Problem solving	
Work-related, thesis, lectures	49
Computer	11
Mathematics	11
Motor Skills	4
Dream as impulse Approaching someone, relationships, travelling, etc.	73
New emotional insights within the dream	40

Continuity between waking and dreaming: A diary study

This diary study (Schredl & Reinhard, 2009-2010) was planned to investigate the continuity between dreaming and waking life in a more detailed way: First, the self-rated effect of waking life on dreaming, second the relationship between emotions during the day and dream emotions, and thirdly, the self-rated effect of dreams on day-time mood. The sample included 74 students whose mean age was 22.3 years (SD = 5.8). There were 62 women and 12 men. Each participant kept a structured diary over a two-week period. The booklet they were given consisted of 14 sheets for recording daytime events and 28 sheets for dream recording. Every evening, they were asked to rate the overall mood during the day along a five-point scale (-2 = very negative, -1 = negative 0 = balanced, 1 = positive, 2 = very positive). Then, six categories (academic studies, partnership, family, friends, personal issues, other) were presented in order to elicit whether positive or negative experiences occurred within one of the specified areas. If an event occurred, the participant was to rate the positive and negative salience of the event on two four-point Likert scales (0 = not salient, 1 = somewhat salient, 2 = salient, 3 = very salient) and briefly describe the event. Six difference scores ranging from -3 to +3 were computed: academic studies, partnership, family, friends, personal issues, and the total score (average of all 6 areas). Starting with the second day, the participants were asked whether and how strong the dream(s) of the previous night has/have affected their mood during the day (0 = no effect, 1 = mildly, 2 = moderately, 3 = strongly).

Each morning, after recording their dreams, participants were instructed to estimate the intensity of positive and negative emotions on two four-point scales (0 = none, 1 = mild, 2 = moderate, 3 = strong). The difference between positive and negative emotions has been computed, reflecting the emotional tone of the dream and ranging from -3 to +3. Then, the participants were asked whether an event of the previous day has affected dream content. Two four-point scales (0 = no effect, 1 = mildly, 2 = moderately, 3 = strongly) were presented: one for the positive effects of daytime events on dream content and one for the negative effects.

Results and Discussion

The mean ratings of positive and negative effects of daytime events did not show any significant differences (see Table 5). The brief descriptions given by the participants were classified into 8 categories (see Table 6). Academic studies and health were mentioned more often on the negative side, whereas events including friends often yielded a positive effect on dreams – in the self-rating of the dreamer.

Table 5. Self-ratings of the effect of daytime events on dreaming.

Variable	Mean ± SD (Nights with dream reports)
Positive effect of daytime event on dreams	0.50 ± 0.89 (N = 432)
Negative effect of daytime event on dreams	0.48 ± 0.85 (N = 432)

Table 6. Topics of daytime events with positive or negative effects on dreams.

Variable	Positive effect (N= 201)	Negative effect (N= 174)
Academic studies	12.9%	28.7%
Partnership	15.9%	12.1%
Family	10.0%	9.8%
Friends	33.3%	13.8%
General mood	5.5%	6.9%
Health	0.0%	13.8%
Concert/film	5.0%	2.9%
Other	17.4%	12.1%

Daytime mood and the mean emotional valence of the daytime events correlated significantly with the emotional tone of the dreams in the expected way (see Table 7). The more positive the day has been the more positive are the dreams of the following night. For the subcategories, only the emotional valence of experiences related to friends was positively related to dream emotions.

The distribution of the answers as to whether the dream of the previous night affected the daytime mood is depicted in Table 8. All four variables (intensity of positive and negative dream emotions and the effect of daytime events on dream content) showed an influence regarding the ratings as to whether dreams affected daytime mood (see Table 9). When all four variables were entered simultaneously into one regression analysis, the largest effects were found for positive dream emotions and the intensity of the negative daytime events on that dream. Whereas the intensity of negative emotions was still significant, no effect was found for the variable that assessed the positive effects of daytime events on dream content.

Table 7. Effects of daytime parameters on dream emotions (emotional tone).

Variable	Dream emotions (nights with dream report)
General mood	.2215*
Academic studies	.0127
Partnership	.0185
Family	.0825
Friends	.1444*
Personal issues	.0997
Total score	.3765*

Parameter estimates of the mixed effect logistic regressions are depicted. (* $p < .05$).

Table 8. Effect of dream on daytime mood.

Category	Percentage (N = 396 nights)
No effect	74.0%
Mild effect	20.7%
Moderate effect	3.5%
Strong effect	1.8%

Table 9. Effect of dream parameters on the chance that dreams affect subsequent day.

Variable	Single Analyses	Total Analysis (All variables entered simultaneously)
Positive dream emotions	.3970**	.6803***
Negative dream emotions	.3118**	.3112*
Positive effect of daytime event on dreams	.2945*	.1566
Negative effect of daytime event on dreams	.5767***	.6918***

Parameter estimates of the mixed effect logistic regressions are depicted. (* $p < .05$, ** $p < .01$, *** $p < .001$)

The findings of the present study demonstrated direct effects of waking life on dreams and of dream emotions on waking-life; even a second-order effect, i.e., dreams that were affected in a negative way by the previous day are more strongly affecting the mood of the next day. One can imagine that this reflects problems processed by the person day and night.

Continuity hypothesis: Discussion and future directions

Although research – as shown by selecting typical studies – has clearly demonstrated the continuity between waking and dreaming in both ways (waking → dreaming and dreaming → waking), a lot of questions are still unanswered. For example, there is a debate of what aspects of waking life are most influential regarding dream content. Are the waking-life experience and its emotional intensity the key players (Schredl, 2003) or waking fantasies (Strauch & Meier, 1996) or the conceptions of the world (Domhoff, 2011). This debate implicate the consideration of how "waking-life" is measured, using questionnaires, for example, to measure stress levels or diaries to elicit the topics most relevant to the dreamer (Schredl, 2012). Another topic raised in the discussion between Allan Hobson and Michael Schredl is the so-called discontinuity of dreaming, i.e., the dreamer experiencing something within the dream that he or she never had experienced in waking life (Hobson & Schredl, 2011). Flying

dreams are a prominent example of discontinuity (Schredl, 2011). What is the underlying principle of this kind of dreams? Maybe, continuity on the level of emotions and not regarding thematic content (Schredl, 2008a). Overall, the factors that affect and modulate continuity between waking and dreaming are not yet fully understood. Whereas emotional intensity of the waking life experience increases the chance of being incorporated into subsequent dreams (Schredl, 2006), other factors like personality have been scarcely studied (Schredl, 2003).

As shown in this paper, studying the effect of dreams on waking life seems very promising. In-depth content analysis of daytime diaries and dream protocols would allow to elucidate the topics and themes that were processed by the dreamer during the day and during the night, the second-order continuity reported by Schredl & Reinhard (2009-2010). Last but not least, studying the effects of dream interpretation (Hill & Knox, 2010), dream literature (Schredl, 2000b) or specific nightmare treatments (Krakow & Zadra, 2010) are the pressing issues from the perspective of clinical psychology.

To summarize, dreaming is highly interwoven with waking on a thematic level. In order to understand this relationship and the possible function of dreaming, research has still to go a long way.

References

Barrett, D. (2001). The committee of sleep: How artists, scientists, and athletes use dreams for creative problem-solving - and how you can too. New York: *Crown.*

Dement, W. C. (1974). Some must watch while some must sleep. San Francisco: *W. H. Freeman*.

Domhoff, G. W. (1996). Finding meaning in dreams: a quantitative approach. New York: *Plenum Press*.

Domhoff, G. W. (2011). Dreams Are Embodied Simulations That Dramatize Conception and Concerns: The Continuity Hypothesis in Empirical, Theoretical, and Historical Context. International *Journal of Dream Research*, 4, ′50-62.

Erlacher, D., & Schredl, M. (2004). Dreams reflecting waking sport activities: a comparison of sport and psychology students. International *Journal of Sport Psychology*, 35, 301-308.

Erlacher, D., & Schredl, M. (2008). Do REM (lucid) dreamed and executed actions share the same neural substrate? International *Journal of Dream Research*, 1, 7-14.

Hall, C. S., & Nordby, V. J. (1972). The individual and his dreams. New York: *New American Library*.

Hill, C. E., & Knox, S. (2010). The use of dreams in modern psychotherapy. *International Review of Neurobiology*, 92, 291-317.

Hobson, J. A., & Schredl, M. (2011). The continuity and discontinuity between waking and dreaming: A Dialogue between Michael Schredl and Allan Hobson concerning the adequacy and completeness of these notions. *International Journal of Dream Research*, 4, 3-7.

Krakow, B., & Zadra, A. (2010). Imagery Rehearsal Therapy: Principles and Practice. *Sleep Medicine Clinics*, 5, 289-298.

Maury, A. (1861). Le sommeil et les reves. Paris: *Didier*.

Schredl, M. (1999). Die nächtliche Traumwelt: Eine Einführung in die psychologische Traumforschung. *Stuttgart: Kohlhammer*.

Schredl, M. (2000a). The effect of dreams on waking life. *Sleep and Hypnosis*, 2, 120-124.

Schredl, M. (2000b). Use of popular dream literature. *Perceptual and Motor Skills*, 90, 1194.

Schredl, M. (2003). Continuity between waking and dreaming: a proposal for a mathematical model. *Sleep and Hypnosis*, 5, 38-52.

Schredl, M. (2006). Factors affecting the continuity between waking and dreaming: emotional intensity and emotional tone of the waking-life event. *Sleep and Hypnosis,* 8, 1-5.

Schredl, M. (2008a). Personality correlates of flying dreams. *Imagination, Cognition and Personality*, 27, 129-137.

Schredl, M. (2008b). Traum. München: Reinhardt/UTB.

Schredl, M. (2009). Effect of dreams on daytime mood: the effects of gender and personality. *Sleep and Hypnosis*, 11, 51-57.

Schredl, M. (2010). Do Sleep Disorders Affect the Dreaming Process? Dream Recall and Dream Content in Patients with Sleep Disorders. *Sleep Medicine Clinics*, 5(2), 193-202.

Schredl, M. (2011). Frequency and nature of flying dreams in a long dream series. International *Journal of Dream Research*, 4, 31-34.

Schredl, M. (2012). Continuity in studying the continuity hypothesis of dreaming is needed. International *Journal of Dream Research*, 5, 1-8.

Schredl, M., & Erlacher, D. (2003). The problem of dream content analysis validity as shown by a bizarreness scale. *Sleep and Hypnosis*, 5, 129-135.

Schredl, M., & Erlacher, D. (2007). Self-reported effects of dreams on waking-life creativity: An empirical study. *Journal of Psychology, 141*, 35-46.

Schredl, M., & Erlacher, D. (2008). Relationship between waking sport activities, reading and dream content in sport and psychology students. *Journal of Psychology*, 142, 267-275.

Schredl, M., & Hofmann, F. (2003). Continuity between waking activities and dream activities. *Consciousness and Cognition*, 12, 298-308.

Schredl, M., & Reinhard, I. (2009-2010). The continuity between waking mood and dream emotions: Direct and second-order effects. Imagination, *Cognition and Personality 29*, 271-282.

Schredl, M., Riemann, D., & Berger, M. (2009). The effect of trimipramine on dream recall and dream emotions in depressive outpatients. *Psychiatry Research*, 167, 279-286.

Strauch, I., & Meier, B. (1992). Den Träumen auf der Spur - Ergebnisse der experimentellen Traumforschung. *Bern: Huber*.

Strauch, I., & Meier, B. (1996). In search of dreams: results of experimental dream research. Albany: *State University of New York Press*.

Strauch, I., & Meier, B. (2004). Dem Traum auf der Spur: Zugang zur modernen Traumforschung (2. Auflage). *Bern: Hans Huber*.

SONO, SONHOS E SOCIEDADE

Teresa Paiva *

1. O Sono

O sono é um enigma que, desde tempos imemoriais, vem suscitando as mais variadas interpretações, muitas com conteúdos míticos e fantásticos. A obrigatoriedade da interrupção da actividade física e o seu padrão cíclico, a duração (ocupamos um terço das nossas vidas a dormir), a analogia com a morte, a postura "receptiva", a vulnerabilidade aparente, a coexistência de sonhos e a proximidade de níveis "profundos" e "irracionais" do ser, adensam o mistério.

Desde a Antiguidade e em todas as culturas que o homem procura encontrar explicações para o sono. A semelhança com a morte é frequentemente realçada. Na mitologia grega Hypnos é o irmão da morte, na Bíblia o "sono profundo é semelhante à morte"[1] e o povo diz que "o sono é a antecâmara da morte". Esta semelhança foi fatal para Romeu ao encontrar Julieta num sono de morte e, a controvérsia desta relação persiste ainda hoje pois, enquanto muitos têm medo de morrer a dormir, outros tantos dirão que essa é uma "morte santa".

Aristóteles (350 AC) concebeu o sono como resultado de processos orgânicos desencadeados pela ingestão dos alimentos e pela fadiga e identificou a sua universalidade no reino animal; Claparède (1905) sugeriu que o sono teria uma função positiva, prevenindo a exaustão induzida pela vigília; na mesma linha Pavlov considerava que ele constituía uma protecção de estimulação excessiva ou conflitual.

Mais recentemente, tendo em conta o "preço a pagar" em termos de sobrevivência por um estado "desprotegido" Rechtschaffen postulou como função principal do sono a conservação de energia (1974); Borbély, hipotetizou uma função dupla, restauradora da vigília e adaptativa, aumentando a capacidade de sobrevivência (1982), finalmente Webb pro-

* Faculdade de Medicina, Universidade Clássica de Lisboa e ISTL, Portugal

[1] Samuel, 26-12

pôs uma função tripla: restauradora, adaptativa e comportamental (1974) (citações de Carskadon et al. 1993).

A moderna investigação faculta o conhecimento de sistemas de descrição e de mecanismos neurofisiológicos e neuroquímicos que regulam e controlam o sono. Dispõe-se assim de informação que é detalhada quanto ao modo como o sono ocorre, mas que permanece insuficiente quanto a explicações funcionais.

O ciclo sono-vigília é hoje em dia bem compreendido sendo claras e indiscutíveis as interações mútuas há muito conhecidas (Borbély 1982). A compreensão da influência da regulação do sono na vida social e vice-versa tem sido assunto recorrente nas últimas décadas. O respectivo impacto sobre o estado de saúde e o bem-estar, tanto individual como colectivo, fomentam a cada dia novos estudos e, por isso os investigadores e clínicos deste início do século XXI são constantemente defrontados com novas investigações e resultados que questionam/reformulam e/ou sedimentam o grande corpo de conhecimentos já adquirido.

O impacto das alterações do sono, ou mais propriamente do ciclo sono vigília, sobre a vida quotidiana individual e social é enorme por diversas razões.

- A privação aguda de sono tem como consequências a dificuldade no desempenho de tarefas e uma maior propensão para dormir e, se prolongada, acarreta alterações de linguagem, nistagmo e alucinações.
- A privação crónica de sono tem como consequências depressão, irritabilidade, maior risco de acidentes e de doenças médicas (hipertensão, diabetes, obesidade, cancro) e morte mais precoce.

2. Os Sonhos

Os sonhos são provavelmente o substrato da noção de alma e espírito e são o ambiente virtual mais antigo da espécie humana. Efetivamente muitos povos primitivos consideravam que não se devia acordar quem dormia, para não impedir o regresso da alma ou do espírito ao corpo.

Os primeiros registos de sonhos são antiquíssimos, cerca de 3000 AC, e encontraram-se na Mesopotâmia, região entre o Tigre e o Eufrates, que hoje em dia corresponde ao Iraque. Foi aí que a civilização Suméria

os utilizou terapeuticamente: os sonhos eram contados aos "padres dos sonhos" que prediziam o futuro do sonhador.

Este costume foi transmitido aos Egípcios, Gregos, Hebreus e Árabes que mantiveram esta tradição de veículo curador dos sonhos e desenvolveram a tradição de interpretar os sonhos.

Os egípcios viam os sonhos como mensagens dos deuses e criaram o seu livro dos Sonhos, que se encontra atualmente no Museu Britânico, em Londres. Os intérpretes dos sonhos viviam em templos dedicados ao deus Serapis, adorado por egípcios e gregos, e posteriormente pelos romanos. Estes padres dos sonhos celebravam rituais e recitavam orações esperando que os sonhos revelassem fragmentos do futuro. Os sonhos dos Faraós eram vistos como mensagens dos deuses e, por isso mesmo, particularmente relevantes.

Na tradição hebraica os profetas Jacó, José e Daniel tinham a capacidade de interpretar os sonhos. Na Grécia, Esculápio, o deus-pai da Medicina, viveu no século 11 AC e era filho do deus Apolo e de uma mulher, Coronis. Foi reconhecido por ter grandes capacidades curativas e ser capaz de ressuscitar os mortos, razão pela qual foi morto por Zeus. Teve 5 filhas e 2 filhos. Os filhos seguiram os passos do pai na prática da Medicina, mas foram elas, também consideradas deusas, que deram nome a algumas disciplinas médicas. De Higeia, deusa da saúde, limpeza e sanidade, originou-se a Higiene; Laso, era a deusa da recuperação da doença; Aceso, a deusa da cura; Aglea, a deusa da beleza, esplendor, glória e magnificência e Panaceia, a deusa do remédio universal.

Nos séculos subsequentes proliferaram os templos de Esculápio, aos quais os doentes acorriam para obterem cura através dos seus sonhos. Efectivamente os doentes que chegavam eram entrevistados por um padre, e após dormiam num local especialmente concebido para tal, a gruta dos sonhos; deviam então sonhar com Esculápio e na manhã seguinte a descrição dos sonhos sugeria medidas terapêuticas. Os templos de Esculápio eram enormes e complexas construções arquitectónicas, que proliferaram na época, e entre os mais célebres contam-se o de Epidauro, Roma, Atenas, Cós e Pergamos.

Será mais tarde com Aristóteles, 335 AC, que surgem duas noções fundamentais: os sonhos não advinham dos deuses mas os humanos podiam adquirir a sabedoria pura durante o sono.

Mas apesar disto os sonhos continuarão nas tradições monoteístas, cristã e muçulmana, a ser entendidos como mensagens de Deus.

Na tradição cristã estes sonhos proféticos mantêm-se: São José recebe nos seus sonhos a inspiração e os conselhos do anjo Gabriel, que deste modo lhe anuncia a gravidez de Nossa Senhora, a necessidade de fugir a Herodes levando a família, e a possibilidade de um regresso seguro.

Mais tarde será também através dos sonhos que a inspiração divina aconselha Don Bosco, São Francisco de Assis e São Patrício a fundar ordens religiosas.

De acordo com a tradição islâmica, sonhar com o profeta Maomé significa uma maior espiritualidade, que deverá ser continuada através da oração.

Já na nossa época os sonhos de artistas e cientistas permitem-lhes a criação de obras de arte ou descobertas científicas.

Os sonhos levaram Kekulé à descoberta da estrutura do anel de benzeno, Otto Loewi aos princípios da neurotransmissão química, Elias Howe à descoberta da máquina de costura e Mendeleev à descrição da tabela periódica dos elementos. Na literatura e na arte os sonhos surgem ou como ambiente criado pelo artista ou, tal como para os cientistas, eles concebem a obra por inspiração dos seus sonhos.

Finalmente os sonhos são os verdadeiros precursores da realidade virtual. Foi neles que acreditámos no impossível ou implausível, foi neles que aprendemos sequências fantásticas, foi através deles que percebemos que há duas realidades, a exterior "vista" pelo nosso cérebro e a interior, sentida ou criada, pelo nosso cérebro.

Apesar deste percurso tão longínquo e ancestral os sonhos só recentemente, nos últimos 2 séculos, foram tidos como objecto de investigação científica.

Em 1861 Alfred de Maury, em França, escreve o livro "Le sommeil et les Rêves" e poucos anos depois, em 1867, o Marquês d´Harvey Saint Denis, escreve uma outra obra "Les rêves et les moyens de les diriger: Observations pratiques".

Maury sonhou o célebre sonho da guilhotina, ou seja, sonhou que ia ser condenado à morte por guilhotina e ao acordar subitamente verificou que uma seta da sua cama lhe tinha caído no pescoço. Esta é pois uma das primeiras observações objectivas sobre a integração de fenómenos exteriores nos conteúdos oníricos. O marquês de Saint Denis faz a primeira descrição de um sonho lúcido.

Gélineau descreve a Narcolepsia em 1880, e no virar desse século Freud publica "A interpretação dos sonhos". As suas teorias sobre os sonhos têm um impato enorme: os sonhos, que são, para ele, os guardiões do sono, representam desejos reprimidos, e por isso desenvolve a técnica de interpretação dos sonhos. Jung, também de escola psicanalítica, desenvolve a noção do inconsciente colectivo, basicamente composto por arquétipos transculturais.

No século XX a investigação onírica continua: Henri Piéron levanta em 1913 a ideia das hipnotoxinas, na Alemanha Klaue, em 1937, descreve no gato o "Tiefen Schlaff" como diferente do sono de ondas lentas e em 1944, Ohlmeyer descreve erecções periódicas durante o sono.

Destas observações empíricas e dispersas irá surgir nos EUA a descoberta essencial, ou seja, a do sono REM, feita em 1953 por Nathaniel Kleitman e Eugéne Aserinski (Aserinski e Kleitman 1953).

Esta descoberta tem uma história curiosa baseada em factos da vida real. Kleitman, que tinha um filho pequeno, estava interessado em saber se os acordares regulares dos bebés para se alimentarem eram múltiplos do ciclo básico de actividade-repouso e se os movimentos oculares podiam medir a profundidade do sono. Deu a Aserinski a tarefa de o investigar, e chegou à conclusão, usando épocas de observação de 5 minutos, que efectivamente havia um ritmo, e em consequência seria importante investigar esse mesmo ritmo em adultos.

De seguida William Dement descreve em 1953 o EEG de baixa voltagem no sono REM do gato (Dement 1953) e em 1955 a natureza cíclica do sono, e em 1957-58 as relações entre sono REM e sonho (Dement e Kleitman 1957). Por essa altura Michel Jouvet descreve em França as características paradoxais do sono REM (Jouvet et al. 1959) e propõe a sua função como programador genético, responsável pela herança psicológica e pela especificidade das espécies animais. Descreve ainda o efeito das lesões protuberanciais no sono do gato (Jouvet e Mounier, 1960).

Nas décadas seguintes são estudados os efeitos da privação de sono REM em humanos e as consequências em termos de psicose e depressão.

Dos dados experimentais resultaram diversas teorias sobre a génese/função dos sonhos.

Em 1977 Hobson e Mc Carley descrevem as pontas geniculo-occipitais e entre 1978 e 1988 ambos propõem que durante o sonho o

córtex tenta retirar algum sentido dos impulsos aleatórios e sem significado específico que recebe do tronco cerebral. Esta é basicamente a Teoria de Activação-Síntese desenvolvida pela escola de Harvard, Hobson, Stickgold e Pace Schott (Hobson et al 2000).

Cartwright em 1993 considera que os sonhos reflectem as nossas preocupações emocionais conscientes podendo ser usado em psicoterapia.

Mark Solms, na herança psicanalítica, considera que os sonhos são gerados por um estado de motivação e desejo (Solms 1997).

Antti Revensuo (Revensuo 2000) considera que os sonhos permitem a simulação segura de acontecimentos ameaçadores, permitindo o treino de modos mais eficazes de lidar com eles.

Tore Nielsen propõe que os sonhos são simuladores da realidade (Nielsen e Stenstrom 2005).

Os métodos de observação dos sonhos também mudaram:

Calvin Hall desenvolve entre 1947 e 1953 um método adequado a estudar grande número de sonhos, tendo em conta a relação entre a simbologia onírica e as metáforas da vigília.

David Foulkes estabelece as relações entre sonhos e fases do sono em crianças do sexo masculino (Foulkes et al. 1967) e as diferenças entre sonhos em casa e no laboratório (Foulkes 1979).

Van de Castle desenvolve um sistema normativo e multicultural de análise dos conteúdos oníricos, que é posteriormente desenvolvido e publicado por Domhoff em 1996.

Em 1992 Hobson propõe o "Night cap" que possibilita a observação de grande número de sonhos REM em casa das pessoas.

Mais recentemente Maquet em 1996 e Nofzinger em 1997 utilizam métodos de imagem na observação dos sonhos, iniciando deste modo uma anatomia onírica.

Tore Nielsen descreve o estado "REM encoberto"(Nielsen 2000), a organização circadiana dos sonhos Nielsen 2004).

O papel do sono REM e dos sonhos na aprendizagem, memória e criatividade tem sido um tema fulcral da investigação neurobiológica do REM (Stickgold et al. 1999 e 2001; Nielsen 2005).

As aplicações clínicas dos sonhos são mais recentes, designadamente o estudo das suas relações com doenças do sono e patologias psiquiátricas (Schredl 2012; Paiva e Rebocho 2013).

3. A Cultura e o Sono

A Cultura é um conceito complexo que inclui parâmetros tão diferentes como etnicidade, estilos de vida, níveis sócio-económicos, religião, história, aspectos politicos, território e clima, etc.

Um aspeto básico a discutir é se o sono, sendo um processo biológico básico, se mantém independentemente da etnia, dos aspetos logísticos, das componentes culturais e dos estilos de vida.

A etnia influencia não só as características do sono, como também a prevalência das doenças do sono, designadamente:

- Em Singapura, o risco de desenvolver apneia do sono é diferente entre as etnias Indiana e Chinesa (Khoo et al. 2004; Ng and Tan 2005).
- Nos EUA os Afro-Americanos têm maior risco de desenvolver apneia do sono (Friedman et al. 2006).
- Nos EUA os riscos de insónia em adolescentes são maiores em Latino-Americanos e menores em Sino-Americanos;
- Nos EUA os riscos de insónia em adolescentes são maiores en Afro e Latino-Americanos e menores em Anglo Americanos (Roberts et al. 2000).
- A prevalência de Narcolepsia é muito baixa em Israel e muito mais elevada no Japão.

Apesar disto grandes estudos epidemiológicos relativos aos riscos para a saúde do encurtamento do sono mostraram resultados idênticos para todas as idades, regiões e continentes, provando assim que eles são independentes da etnia e do clima, e aproximando neste sentido o sono de um processo biológico universal.

Os hábitos de sono variam tremendamente nas várias culturas, que influenciam aspectos básicos como, a cama, os comportamentos associados com o início do sono, o dormir acompanhado, as estratégias de despertar, a duração e ocorrência temporal do sono, etc. (Webb 1993)

Apesar da variabilidade cultural a globalização tende a modificar de forma rápida e importante uma cultura específica.

O contínuo sono-vigília é ainda influenciado por estilos de vida, como alimentação, exercício, horários de trabalho, e por factores ambientais, como a luz, ruído, temperatura, sazonalidade, que por sua vez variam

enormemente entre países e continentes. As modificações nos hábitos de sono durante o último século têm sido enormes: umas têm que ver com as marcadas mudanças de hábitos sociais e individuais registadas no último século, com consequências fundamentais na duração e organização do sono-vigília; outras têm que ver com as funções do sono e com a influência das respectivas alterações na saúde e na vida quotidiana (Paiva e Penzel 2011).

Durante o século XX a energia passou a estar disponível de forma generalizada e houve importantes mudanças sociais. Algumas tiveram impacto no sono-vigília: o trabalho por turnos generalizou-se a múltiplos grupos profissionais e a todos os continentes; as viagens intercontinentais tornaram-se comuns; a sociedade do trabalho instalou-se com exigência de maiores ritmos de trabalho e maior competição; a sociedade 24 horas "on-line" tornou-se regra.

Em consequência de tudo isto o dia estendeu-se para a noite, o sono ficou mais curto e passou a ocorrer fora de horas; os ritmos alimentares modificaram-se com refeições rápidas, irregulares e em pé; o *stress* aumentou. A fadiga tornou-se uma queixa comum e diversas indústrias foram afectadas directamente por isso; entre elas sobressai a indústria dos transportes, nas suas diversas componentes, transportes individuais, camionagem, comboios, transportes aéreos e marítimos.

Como frase a não esquecer apenas se diz que a privação de sono na condução automóvel acarreta um risco maior que o excesso de álcool.

As viagens transmeridianas e a sociedade de trabalho nas 24 horas evidenciam repercussões negativas sobre o sistema sono vigília, mas é com grandes acidentes catastróficos como o do Space Suttle, de Chernobyl em 1986 e o do petroleiro ExxonValdez em 1989, que se identifica uma nova classe de problemas: os acidentes relacionados com a fadiga na qual intervem o ciclo sono-vigília.

No Brasil dados epidemiológicos recentes mostram a prevalência muito elevada das doenças do sono (Santos Silva et al. 2010, Tufik et al. 2010).

Os Portugueses têm uma baixa satisfação relativamente ao seu sono (Ohayon e Paiva 2005), com um aumento progressivo de consumo ambulatório de hipnóticos, ansiolíticos e antidepressivos desde 2002 a 2009, o qual, em 2008, é cerca de 4 vezes superior ao melhor valor da UE (Plano Nacional de Saúde 2009).

40% dos estudantes liceais ou universitários dorme de menos (Carskadon et al. 1998). Tanto em Portugal como no Brasil vários estudos comprovam estes resultados e/ou demonstram as consequências no sucesso escolar ou na saúde (Teixeira et al. 2007, Padez et al. 2009, Bernardo et al 2009, Cunhal et al 2010, Gomes et al. 2011, Boto et al. 2011).

A privação de sono experimental ou crónica tem repercussões cardiovasculares. Períodos experimentais de privação aumentam a pressão arterial e a actividade simpática (Spiegel et al. 1999) e os marcadores inflamatórios associados a maior risco cardio-vascular (PCR) (Méier Ewert et al. 2004).

Vários trabalhos mostram que tanto o "dormir de menos" como o "dormir demais" estão associados a um maior risco coronário (um estudo epidemiológico em 7100 enfermeiras (Ayas et al. 2003)) ou a um aumento de mortalidade (Kripke et al. 2002, Liu et al. 2002). Para além do factor "duração" há ainda o factor circadiano com picos matinais no aparecimento de enfartes de miocárdio ou na prevalência de mortes.

Para além disto há ainda o risco de obesidade associado à redução do sono, facto relacionado com o aumento matinal do cortisol, à redução da leptina (Mullinghton et al. 2003, Caballero 2007). A redução do sono tem também maior risco de diabetes por aumento da resistência à insulina, facto que também acontece na apneia do sono de forma independente da obesidade (Ayas et al. 2003[a]).

Finalmente há a considerar as repercussões negativas que as doenças do sono têm sobre a saúde e a qualidade de vida dos indivíduos citando-se neste enquadramento estudos de Portugal e do Brasil (Gonçalves et al. 2004, de Castro Toledo Guimarães et al. 2008, Smith 2009, Nunes et al. 2009, Andersen et al. 2010, Pedrosa et al. 2010, Araujo et al. 2011, Nerbass et al. 2011, Paiva e Antunes 2011, David et al. 2011, Afonso et al. 2011, Maia et al. 2011).

4. A Cultura e os Sonhos

A cultura influencia a interpretação de sonhos e das suas consequências (Hufford 2005, de Jong 2005).

Existe hoje em dia uma enorme literatura relativa à interpretação dos sonhos, com códigos e dicionários de interpretação dos mesmos. Uma

pesquisa na internet sobre interpretação de sonhos em inglês fornece 10.700.000 resultados, e 190.000 se feita em português.

Hoje, tal como antigamente, há lideres religiosos a declararem que iniciaram essa actividade por inspiração divina recebida em sonhos.

Esta mesma inspiração parece estender-se a artistas (Justin Bieber e a sua Canção de Natal) e outros cidadãos, certos da sua missão na terra.

A paralisia do sono é porventura a perturbação do sono mais descrita em múltiplas culturas, sendo muitas vezes interpretada como um ataque ou uma acção de um espírito ou fantasma, predominantemente maléfico.

Assim acontece na cultura popular chinesa e turca (Law and Kirmayer 2005); na mitologia escandinava é uma mulher maléfica, Mara, no México é a "a subida del muerto", na Alemanha e no sul dos EUA é uma bruxa ("Hexendrücken").

Conceitos equivalentes podem ser encontrados na Coreia, Indonésia, Filipinas, Vietnam, Malásia, Húngria, Rússia, e nas culturas Islâmica e do Laos.

Bibliografia

Afonso P, Brissos S, Figueira ML, Paiva T. Schizophrenia patients with predominantly positive symptoms have more disturbed sleep-wake cycles measured by actigraphy. Psychiatry Res. 2011 Aug 30;189(1):62-6. Epub 2011 Jan 22. PubMed PMID: 21257208.

Andersen ML, Santos-Silva R, Bittencourt LR, Tufik S. Prevalence of erectile dysfunction complaints associated with sleep disturbances in Sao Paulo, Brazil: a population-based survey. Sleep Med. 2010 Dec;11(10):1019-24. Epub 2010 Apr 27. PubMed PMID: 20427234.

Araujo P, Mazaro-Costa R, Tufik S, Andersen ML. Impact of sex on hyperalgesia induced by sleep loss. Horm Behav. 2011 Jan;59(1):174-9. Epub 2010 Nov 21. PubMed PMID: 21081131.

Aserinsky E, Kleitman N. Regularly occurring periods of eye motility, and concomitant phenomena, during sleep. Science. 1953 Sep 4;118(3062):273-4.

Ayas NT, White DP, Al-Delaimy WK, Manson JE, Stampfer MJ, Speizer FE, Patel S, Hu FB. A prospective study of self-reported sleep duration and incident diabetes in women. Diabetes Care. 2003 Feb;26(2):380-4.

Ayas NT, White DP, Manson JE, Stampfer MJ, Speizer FE, Malhotra A, Hu FB. A prospective study of sleep duration and coronary heart disease in women. Arch Intern Med. 2003 Jan 27;163(2):205-9.

Bernardo MPSL, Pereira EF, Louzada FM and D'Almeida V. Duração do sono em adolescentes de diferentes níveis socioeconômicos. J. bras. psiquiatr.. 2009, vol.58, n.4, pp. 231-237 .

Borbely AA. A two process model of sleep regulation. Hum Neurobiol. 1982;1(3):195-204.

Boto LR, Crispim JN, Melo IS, Juvandes C, Rodrigues T, Azeredo P, Ferreira R. Sleep deprivation and accidental fall risk in children. Sleep Med (2011), doi:10.1016/j.sleep.2011.04.010

Caballero B. The global epidemic of obesity: an overview. Epidemiol Rev 2007;29:1-5.

Carskadon MA, Rechtschaffen A, Richardson G, Roth T, Siegel J Encyclopedia of Sleep and Dreaming, Mac Millan Publishing Company, 1993

Carskadon MA, Wolfson AR, Acebo C, Tzischinsky O, Seifer R. Adolescent sleep patterns, circadian timing, and sleepiness at a transition to early school days. Sleep. 1998 Dec 15;21(8):871-81.

Cartwright RD. Who needs their dreams? The usefulness of dreams in

Claparède E 1905 Esquisse d'une théorie biologique du sommeil. Archives de psychologie 4:245–349.

Cunhal P, Cunhal M, Paiva T. Gender differences in sleep habits of university students JSR, suppl 2010.

David A, Constantino MF, Paiva T Qualidade de vida nos doentes com narcolepsia. In Qualidade de Vida e Saúde, ed José Carlos Souza, Vetor Editora, 2011.

de Castro Toledo Guimaraes LH, de Carvalho LB, Yanaguibashi G, do Prado GF.Physically active elderly women sleep more and better than sedentary women. Sleep Med. 2008 Jul;9(5):488-93. Epub 2007 Aug 30. PubMed PMID: 17765012.

de Jong JT. Cultural variation in the clinical presentation of sleep paralysis. Transcult Psychiatry. 2005 Mar;42(1):78-92. PubMed PMID: 15881269.

Dement, W., Kleitman, N. (1957): The regulation of eye movements during sleep to dream activity: an objective method for the study of dreaming. J. Exp. Psychol., 53:339-346.

Foulkes D, Pivik T, Steadman HS, Spear PS, Symonds JD. Dreams of the male child: an EEG study. J Abnorm Psychol. 1967 Dec;72(6):457-67. PubMed PMID: 6076851.

Foulkes D. Home and laboratory dreams: four empirical studies and a conceptual reevaluation. Sleep. 1979;2(2):233-51. PubMed PMID: 232567.

Friedman M, Bliznikas D, Klein M, Duggal P, Somenek M, Joseph NJ. Comparison of the incidences of obstructive sleep apnea-hypopnea syndrome in African-Americans versus Caucasian-Americans. Otolaryngol Head Neck Surg. 2006 Apr;134(4):545-50. PubMed PMID: 16564370.

Gomes AA, Tavares J, Azevedo MHP Sleep and Academic Performance in Under-

graduates: A Multi-measure, Multi-predictor Approach Chronobiology International, 2011, 28(9): 786–801.

Goncalves MA, Paiva T, Ramos E, Guilleminault C. Obstructive sleep apnea syndrome, sleepiness, and quality of life. Chest. 2004 Jun;125(6):2091-6. PubMed PMID: 15189926.

Hobson JA, McCarley RW. The brain as a dream state generator: an activation-synthesis hypothesis of the dream process. Am J Psychiatry. 1977 Dec;134(12):1335-48. PubMed PMID: 21570.

Hobson JA. Sleep and dreaming: induction and mediation of REM sleep by cholinergic mechanisms. Curr Opin Neurobiol. 1992 Dec;2(6):759-63. Review. PubMed PMID: 1477541.

Hobson JA, Pace-Schoot E, Strickgold R. Dreaming and the brain: towards a cognitive neuroscience of conscious states. Behavior Brain Sci 2000; 23: 793-842.

Hufford DJ. Sleep paralysis as spiritual experience. Transcult Psychiatry. 2005 Mar;42(1):11-45. PubMed PMID: 15881267.

Jouvet M Le Chateau des Songes, ed Odile Jacob, 1992

Jouvet M, Michel F, Courjon J. [Bringing into play of two mechanisms with different electroencephalographic expression during physiological sleep in the cat]. C R Hebd Seances Acad Sci. 1959 May 25;248(21):3043-5. French. PubMed PMID:13663320.

Khoo SM, Tan WC, Ng TP, Ho CH. Risk factors associated with habitual snoring and sleep-disordered breathing in a multi-ethnic Asian population: a population-based study. Respir Med. 2004 Jun;98(6):557-66.

Kripke DF, Garfinkel L, Wingard DL, Klauber MR, Marler MR. Mortality associated with sleep duration and insomnia. Arch Gen Psychiatry. 2002 Feb;59(2):131-6.

Law S, Kirmayer LJ. Inuit interpretations of sleep paralysis. Transcult Psychiatry. 2005 Mar;42(1):93-112. PubMed PMID: 15881270.

Liu Y, Tanaka H; Fukuoka Heart Study Group. Overtime work, insufficient sleep,and risk of non-fatal acute myocardial infarction in Japanese men. Occup Environ Med. 2002 Jul;59(7):447-51. PubMed PMID: 12107292; PubMed Central PMCID:PMC1740308.

Maia A, McIntyre T, Pereira MG, Ribeiro E. War exposure and post-traumatic stress as predictors of Portuguese colonial war veterans' physical health. Anxiety Stress Coping. 2011 May;24(3):309-25. doi: 1080/10615806.2010.521238. PubMed PMID: 20945238.

Maquet P, Péters J, Aerts J, Delfiore G, Degueldre C, Luxen A, Franck G. Functional neuroanatomy of human rapid-eye-movement sleep and dreaming. Nature. 1996 Sep 12;383(6596):163-6. PubMed PMID: 8774879.

Meier-Ewert HK, Ridker PM, Rifai N, Regan MM, Price NJ, Dinges DF, Mullington JM. Effect of sleep loss on C-reactive protein, an inflammatory marker of cardiovascular risk. J Am Coll Cardiol. 2004 Feb 18;43(4):678-83.

Moreira P, Santos S, Padrão P, Cordeiro T, Bessa M, Valente H, Barros R, Teixeira V, Mitchell V, Lopes C, Moreira A. Food patterns according to sociodemographics, physical activity, sleeping and obesity in Portuguese children. Int J Environ Res Public Health. 2010 Mar;7(3):1121-38. Epub 2010 Mar 17. PubMed PMID: 20617022; PubMed Central PMCID: PMC2872303.

Mullington JM, Chan JL, Van Dongen HP, Szuba MP, Samaras J, Price NJ, Meier-Ewert HK, Dinges DF, Mantzoros CS. Sleep loss reduces diurnal rhythm amplitude of leptin in healthy men. J Neuroendocrinol. 2003 Sep;15(9):851-4.

Nerbass FB, Pedrosa RP, Genta PR, Drager LF, Lorenzi-Filho G. Calcium channel blockers are independently associated with short sleep duration in hypertensive patients with obstructive sleep apnea. J Hypertens. 2011 Jun;29(6):1236-41.PubMed PMID: 21546880.

Ng TP, Tan WC. Prevalence and determinants of excessive daytime sleepiness in an Asian multi-ethnic population. Sleep Med. 2005 Nov;6(6):523-9. Epub 2005 Apr 1. PubMed PMID: 16271696.

Nielsen TA, Stenstrom P. What are the memory sources of dreaming? Nature. 2005 Oct 27;437(7063):1286-9. PubMed PMID: 16251954.

Nielsen TA. A review of mentation in REM and NREM sleep: "covert" REM sleep as a possible reconciliation of two opposing models. Behav Brain Sci. 2000 Dec;23(6):851-66; discussion 904-1121. Review. Erratum in: Behav Brain Sci 2001 Jun;24(3):576. PubMed PMID: 11515145.

Nielsen TA. Chronobiological features of dream production. Sleep Med Rev. 2004 Oct;8(5):403-24. Review. PubMed PMID: 15336239.

Nielsen, T.A. & Zadra, A. (2005). Nightmares and other common dream disturbances. In: M.H. Kryger, T. Roth and W.C. Dement (Eds), Principles and Practice of Sleep Medicine. Elsevier Saunders, 926-935.

Nofzinger EA, Mintun MA, Wiseman M, Kupfer DJ, Moore RY. Forebrain activation in REM sleep: an FDG PET study. Brain Res. 1997 Oct 3;770(1-2):192-201. PubMed PMID: 9372219.

Nunes DM, Mota RM, de Pontes Neto OL, Pereira ED, de Bruin VM, de Bruin PF. Impaired sleep reduces quality of life in chronic obstructive pulmonary disease. Lung. 2009 May-Jun;187(3):159-63. Epub 2009 Apr 28. PubMed PMID: 19399553.

Ohayon MM, Paiva T. Global sleep dissatisfaction for the assessment of insomnia severity in the general population of Portugal. Sleep Med. 2005 Sep;6(5):435-41. PubMed PMID: 16085459.

Padez C, Mourao I, Moreira P, Rosado V. Long sleep duration and childhood overweight/obesity and body fat. Am J Hum Biol. 2009 May-Jun;21(3):371-6

Paiva e Penzel Centro de Medicina do Sono- Manual prático, Lidel 2011

Paiva T, Antunes E. Qualidade de vida na insônia. In Qualidade de Vida e Saúde, ed José Carlos Souza, Vetor Editora, 2011.

Pedrosa RP, Lima SG, Drager LF, Genta PR, Amaro AC, Antunes MO, Arteaga E, Mady C, Lorenzi-Filho G. Sleep quality and quality of life in patients with hypertrophic cardiomyopathy. Cardiology. 2010;117(3):200-6. Epub 2010 Dec 8.PubMed PMID: 21150200.

psychotherapy. J Am Acad Psychoanal. 1993 Winter;21(4):539-47. PubMed PMID:8138458.

Revonsuo A. The reinterpretation of dreams: an evolutionary hypothesis of the function of dreaming. Behav Brain Sci. 2000 Dec;23(6):877-901; discussion 904-1121. Review. PubMed PMID: 11515147.

Roberts RE, Roberts CR, Chen IG. Ethnocultural differences in sleep complaints among adolescents. J Nerv Ment Dis. 2000 Apr;188(4):222-9.

Santos-Silva R, Bittencourt LA, Pires MLN, Mello MT, Taddei J, Benedito-Silva AA, Pompeia C, Tufik S. Increasing trends of sleep complaints in the city of Sao Paulo, Brazil. Sleep Med 2010;11:520–4.

Schredl M. Dreams in Patients with Sleep Disorders. In: M.H. Kryger, T. Roth and W.C. Dement (Eds), Principles and Practice of Sleep Medicine. Elsevier Saunders. 2012.

Smith AK, Togeiro SM, Tufik S, Roizenblatt S. Disturbed sleep and musculoskeletal pain in the bed partner of patients with obstructive sleep apnea. Sleep Med. 2009 Sep;10(8):904-12. Epub 2009 Mar 19. PubMed PMID: 19303357.

Solms M. The Neuropsychology of Dreams: A Clinico-Anatomical Study. Lawrence Erlbaum Associates, 1997.

Spiegel K, Leproult R, Van Cauter E. Impact of sleep debt on metabolic and endocrine function. Lancet. 1999 Oct 23;354(9188):1435-9.

Stickgold R, Scott L, Rittenhouse C, Hobson JA. Sleep-induced changes in associative memory. J Cogn Neurosci. 1999 Mar;11(2):182-93. PubMed PMID: 10198133.

Stickgold R. Finding the stuff that dreams are made of. Scientific World Journal. 2001 May 11;1:211-2. PubMed PMID: 12805675.

Teixeira LR, Lowden A, Turte SL, Nagai R, Moreno CRC, Latorre MRDO, et al. Sleep and sleepiness among working and non-working high school evening students. Chronobiol Int. 2007;24(1):99-113.

Webb WB Cultural Aspects of Sleep, in Encyclopaedia of Sleep and Dreaming, ed M A Carskadon, Macmillan Publishing Company, 1993.

DYNAMIC STRUCTURE OF NREM SLEEP AND COGNITION

Péter Halász [*] *and R. Bódiz* [**]

Slow waves have a biological role in plastic changes during NREM sleep

In the last decades the search for the biological role of sleep accumulated important new data on the significance slow wave sleep. The new knowledge about sleep slow waves emerged from the research on homeostatic regulation of NREM sleep.

In the eighties Borbely and co-workers[1] found that deepness of sleep depends on the length of wake state spent before sleep. Longer the wake state deeper the following sleep. Delta EEG power proved to be a good measure of sleep depth and an experimentally replicable way night sleep could be characterized as an exponential decay of delta power, while during wake state naps measured delta amount showed an exponential build up of delta power[2]. Thus delta power has an upscaling course during wake state and this is mirrored by a downscaling process during NREM.

Later it was outlined that the length of wake state is merely a frame within other more important things occur which determines more directly the dynamics of slow wave sleep during the next day. Elegant experiments have shown that increase or decrease of sensory afferentation of a certain cortical region increased or decreased the functionally relevant regional slow wave power [3, 4]. These experiments in the same time provided strong support for the emerging concept of local sleep regulation [5]. Local usage was followed by local increase of delta power. Further research[6] showed that not only boosting the afferentation, but any synaptic potentiation leading to a local learning process increased the delta power. Thus use dependent local homeostasis seems to be associated with plastic changes[7]. We can say that use dependent delta homeostasis and plastic changes during NREM sleep are two sides of the same coin.

* National Institute of Neuroscience,, University of Budapest, Hungary.
** Semmelweis University Institute of Behavioural Sciences, Budapest, Hungary.

The changing views about NREM sleep homeostasis are summarized in the following table 1.

Table 1. The changing views of sleep homeostasis.

Theoretical framework	Nature of sleep homeostasis	Key factor in sleep homeostasis	Experimental protocol	Neurochemical background (antecedents)	Key references
Two-process model	sleep-wake-dependent	pre-sleep wake-fulness	constant routine	Hypnotoxin theory	Borbély (1982)
Neuronal group theory	use-dependent	afferent stimula-tion	pre-sleep stimulation	Somnogenic cytokines	Krueger and Obál (1993), Kattler et al. (1994)
Synaptic homeostasis	experience-dependent	learning	pre-sleep learning	LTP-related neurochemical factor	Tononi and Cirelli (2003), Huber et al. (2004)

Dynamic interplay of sleep-and wake promoting forces during night sleep cyclicity reflected by sleep microstructure

Slow waves are not continuously present in NREM. They are specially distributed across the sleep process during the descending and ascending slopes of the cycles. The two slopes of the cycles are asymmetric, the descending one is longer and smoother, and the ascending is shorter and less smooth, containing sleep level jumps. Slow waves show an uprising course during the descending, while a decreasing course during the ascending slope (beta power reflects a mirror image). The peaks of delta power show exponential decay from cycle to cycle (Fig. 1).

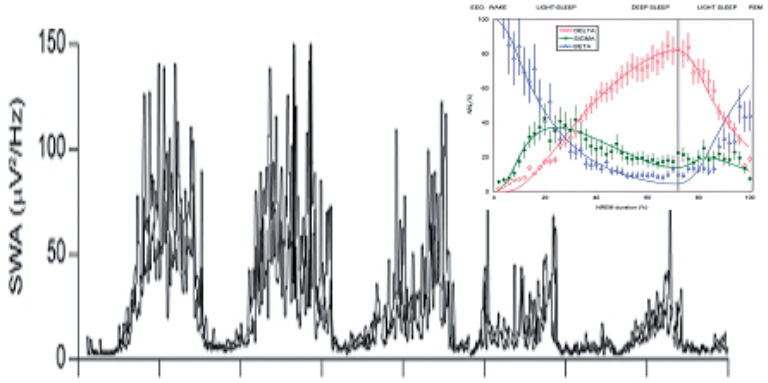

Figure 1. Slow wave (0.75-4.0) power (microvolt/Hz) during night sleep. Typical homeostatic decay from evening to morning. The insert in right upper corner shows the power spectrum composition of the first cycles after Merica and Fortune (2004).

This dynamic change of delta power during the night sleep process and within the cycles as well is underlain by the changing balance of sleep and wake promoting neuronal assemblies located to the brainstem-hypothalamic border field. Sleep promotion is governed by ventrolateral preoptic structures (VLPO and some extended group of neurons) and wake promotion by the brain stem ascending arousal system consisting of several different subsystems driven by histaminergic, cholinergic, aminergic and orexinergic transmitters [8, 9] (Fig. 2).

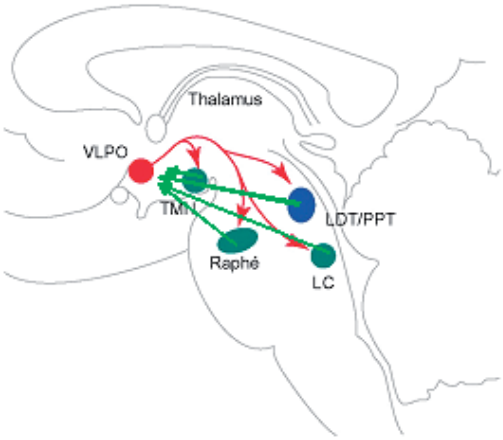

Figure 2. The hypothalamic-brainstem of sleep promoting GABA-ergic and galaninergic neuron groups (red) and ascending arousal system (green) driven by histaminergic (TMN), noradrenergic (LC), cholinergic (LDT/PPT), dopaminergic (raphe) neurongroups. Reciprocal antagonistic relationship (after Saper et al. 2001).

According to the changing balance of the sleep-and wake promoting neuronal activity NREM sleep is an ever changing dynamic system responding to external stimuli by phasic activation. It was recognized from the seventies that phasic activation is reflected in the NREM sleep EEG and polygraph by two forms: arousals with fast activity joined by autonomic and muscle response and „antiarousal" as sleep like slow wave response[10]. Phasic activation became considered as an inherent regulatory component NREM sleep, far beyond to hold it merely as a disturbance of sleep[11]. The earlier described antiarousal like „reactive delta" response is the K-complex[12]. Later by the discovery of Cyclic Alternating Pattern (CAP) phenomenon in the mideighties by the Parma group[13] arousal-antiarousal dynamics have got a frame within the dynamic microstructure of NREM sleep have been studied more systematically (Fig. 3).

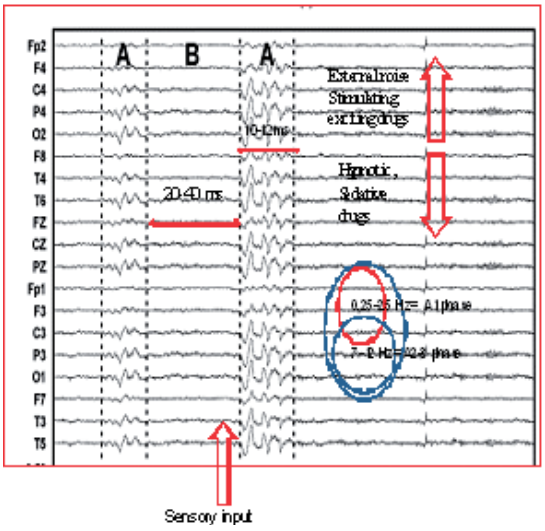

Figure 3. Constituents of Cyclic Alternating Pattern (CAP). A= activity, B= background. Red arrow shows that sensory input is able to elicit from B phase the pattern of A phase. The red circle in the head scheme shows the anterior A1 phase frequency constituents (dominantly 0.25-2.5 Hz) and blue circle the posterior A2-A3 phase frequency (mainly 7-12 Hz) Opposite red arrows indicate that hypnotic/sedative drugs decrease and external noise and stimulating exciting drugs increase CAP rate.

Studies of Terzano et al[14] divided three forms of EEG+polygraphic responses within the frame of CAP (A1-2-3) and they showed that the distribution of A1and A2 types (slow waves with few autonomic and muscle activation) is different compared to A3 (fast activity with autonomic and muscle activation). A1 type follow the homeostatic decay of slow waves, while A3 peaks are before REM sleep periods at the end of the ascending slope of cycles[15].

The sleep like response is mobilized during the descending slope of first cycles, when homeostatic pressure is high and slow wave activity can be mobilized easily (Fig.4).

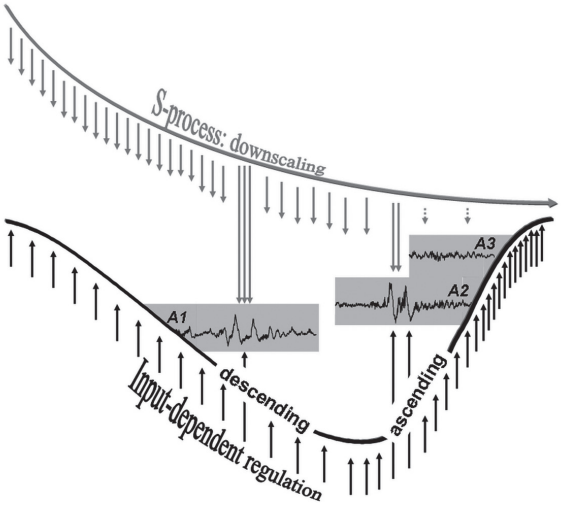

Figure 4. A schematic sleep cycle. Incoming external stimulation elicits during the descending slope, while homeostatic pressure is high (see upper part), A1 responses, maintaining sleep, while during the ascending slope the decreasing sleep pressure allows more frequent and mainly arousal like responses which elicit A2 and first of all A3 type responses promoting the next REM period.

Studies of the beginning of the XXIth century provided further support, that NREM slow wave activity can be boosted by different artificial ways as transcranial magnetic stimulation[16] transcranial electrical stimulation[17] and direct cortical stimulation during NREM sleep[18].

Therefore we propose to consider CAP not only as a marker of sleep instability, but as an instant short term homeostatic tool (a „slow wave injection") as supplementation to any disturbances of NREM sleep (Fig .5).

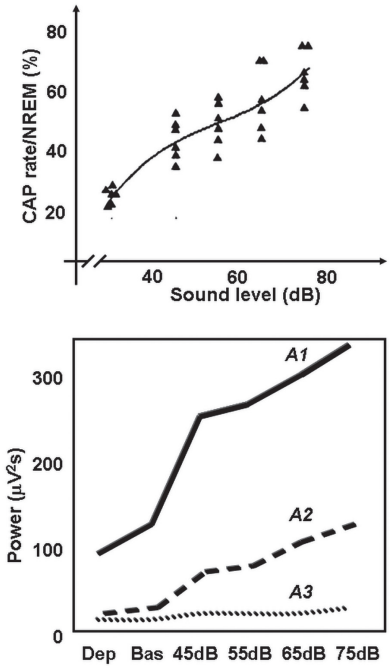

Figure 5. The input- and sleep pressure-dependence of the Cyclic Alternating Pattern (CAP). Top: Increasing level of sound (acoustic stimulation with white noise) lead to increases in CAP-rate. Bottom: Power of the CAP A1 and A2 subtypes (containing slow waves) increases with increasing levels of sound (acoustic stimulation with white noise), while power of A3 (containing fast EEG activity mainly) remains relatively unchanged. Sleep deprivation decreases the power of input-related (reactive) delta bouts. Dep, deprivation; Bas, baseline. Modified from Terzano et al.[19].

Human double homeostatic regulation in protection of frontal lobe cognitive functions

Therefore sleep slow activity seems to be under a double homeostatic regulation: The fundamental difference between the two regulations is that in the instant regulation the sleep disturbing input occurs during sleep, the supplementation of slow waves occurs as an instant response and in the long term regulation the input occurs during wake state and the response is prolonged to the next sleep.

Usually the left hemisphere and the frontal lobes bilateral[20, 21] participation is the largest. Presently we do not know whether this is due

to the characteristics of input factors (left dominance for example might be associated with the great demand in the cortical areas of the speech network) or to the sensitivity (amount of restitutional need) of certain cortical areas (for example frontal areas responsible of human cognitive neofunctions).

Anyhow we should emphasize the prominent role of the frontal lobes being under a double regulation with participation of both the short- and long-term homeostatic process.

Probably the full blown development of these intermingled regulations is a human neoformation which became needed due to the vulnerability of the frontal neocortex and especially for the cognitive functions realized in the hitherto highest level by this structure.

References

1. Borbély AA. A two process model of sleep regulation. *Hum Neurobiol*. 1982;1(3):195-204.

2. Dijk DJ, Beersma DG, Daan S EEG power density during nap sleep: reflection of an hourglass measuring the duration of prior wakefulness. *J Biol Rhythms*. 1987;2 (3):207-19.

3. Kattler H, Dijk DJ, Borbély AA Effect of unilateral somatosensory stimulation prior to sleep on the sleep EEG in humans. *J Sleep Res*. 1994;3 (3):159-164.

4. Huber R, Ghilardi MF, Massimini M, Ferrarelli F, Riedner BA, Peterson MJ, Tononi G. Arm immobilization causes cortical plastic changes and locally decreases sleep slow wave activity. *Nat Neurosci*. 2006;9(9):1169-76.

5. Krueger JM, Obál F. A neuronal group theory of sleep function. *J Sleep Res*. 1993;2(2):63-69

6. Huber R, Määttä S, Esser SK, Sarasso S, Ferrarelli F, Watson A, Ferreri F, Peterson MJ, Tononi G. Measures of cortical plasticity after transcranial paired associative stimulation predict changes in electroencephalogram slow-wave activity during subsequent sleep. *J Neurosci*. 2008;28 (31):7911-8.

7. Huber R, Ghilardi MF, Massimini M, Tononi G. Local sleep and learning. *Nature*. 2004;430(6995):78-81.

8. Saper CB, Chou TC, Scammell TE. The sleep switch: hypothalamic control of sleep and wakefulness. *Trends Neurosci*. 2001;24(12):726-31.

9. Saper CB, Fuller PM, Pedersen NP, Lu J, Scammell TE. Sleep state switching. *Neuron*. 2010;68(6):1023-42.

10. Halász P. Arousals without awakening--dynamic aspect of sleep. *Physiol Behav*. 1993;54(4):795-802

11. Halász P, Terzano M, Parrino L, Bódizs R. The nature of arousal in sleep. *J Sleep Res*. 2004;13(1):1-23.

12. Halász P. K-complex, a reactive EEG graphoelement of NREM sleep: an old chap in a new garment. *Sleep Med Rev*. 2005;9(5): 391-412.

13. Terzano MG, Mancia D, Salati MR, Costani G, Decembrino A, Parrino L. The cyclic alternating pattern as a physiologic component of normal NREM sleep. *Sleep*. 1985;8 (2):137-45.

14. Terzano MG, Parrino L, Boselli M, Smerieri A, Spaggiari MC.CAP components and EEG synchronization in the first 3 sleep cycles. *Clin Neurophysiol*. 2000;111 (2):283-90.

15. Terzano MG, Parrino L, Smerieri A, Carli F, Nobili L, Donadio S, Ferrillo F.CAP and arousals are involved in the homeostatic and ultradian sleep processes. *J Sleep Res*. 2005;14 (4):359-68.

16. Massimini M, Ferrarelli F, Esser SK, Riedner BA, Huber R, Murphy M, Peterson MJ, Tononi G.Triggering sleep slow waves by transcranial magnetic stimulation. *Proc Natl Acad Sci U S A*. 2007 15;104 (20):8496-501.

17. Marshall L, Helgadóttir H, Mölle M, Born J.Boosting slow oscillations during sleep potentiates memory.*Nature*. 2006;444(7119):610-3.

18. Vyazovskiy VV, Faraguna U, Cirelli C, Tononi G. Triggering slow waves during NREM sleep in the rat by intracortical electrical stimulation: effects of sleep/wake history and background activity. *J Neurophysiol*. 2009;101 (4):1921-31.

19. Terzano MG, Parrino L, Fioriti G, Spaggiari MC, Anelli S, Arcelloni T, Orofiamma B, Farolfi A. The Cyclic Alternating Pattern rate: a sleep variable sensitive to environmental modifications. A controlled study utilizing white noise and zolpidem. In: Sauvanet JP, Langer SZ, Morselli PL, editors. Imidazopyridines in sleep disorders. *New York: Raven Press*, 1988. pp. 219-30.

20. Cajochen C, Foy R, Dijk DJ. Frontal predominance of a relative increase in sleep delta and theta EEG activity after sleep loss in humans. *Sleep Res Online.* 1999;2(3):65-9.

21. Finelli LA, Borbély AA, Achermann P.Functional topography of the human nonREM sleep electroencephalogram. *Eur J Neurosci.* 2001;13(12):2282-90.

EXPLORING THE WORLD OF LUCID DREAMING

Stephen LaBerge [*]

Our dreams seem so compellingly real to our sleeping minds that we tacitly accord them the status of physical reality. We do not normally think about the fact that we are dreaming any more than we think about the fact that we are alive. We simply typically act as if whatever we experience is real - until we wake up. Only then, when we catch a glimpse of fleeting memories, do we usually recognize our dreams as the mental experiences they are. In the clear light of morning, what appeared so real the night before now seems no more real than a conjurer's trick, a mirage, or - a dream.

Although this is how most people usually experience their dreams, there is an exceptional case that challenges many assumptions about the nature of sleep and the potentials of the dreaming mind. This significant exception is that sometimes, while dreaming, we know full well that we are in fact dreaming. This remarkably cognizant state of mind is referred to as lucid dreaming.

Lucid dreamers report being fully in possession of their cognitive faculties (this is the meaning of the word lucid): they report being able to reason clearly, to remember the conditions of waking life (including the fact that they are asleep!), and to act voluntarily upon reflection or in accordance with plans decided upon before sleep. At the same time, they remain soundly asleep, vividly experiencing a dream world that can seem astonishingly real.

Because they understand that the dream world is purely mental, lucid dreamers can exert a remarkable degree of control over what happens in dreams, including powers of transformation (e.g., causing dream figures and objects to appear or disappear at will) and violations of the laws of physics (e.g., flying) that would seem magical if not impossible in the physical world.

[*] University of Stanford and the Lucidity Institute, Inc., USA.

Dreaming and consciousness

Whether awake or asleep, one of our brain's most critical tasks is constructing the model of the world around us that we experience as our consciousness. While awake, this model draws predominantly on sensory input, the best available information about what is going on around us. Since the purpose of the model is to help us survive, the world-making process also considers motivational information about our current needs, emotions, and goals. While sleeping, very little sensory input is available to tell us what is going on, so the world model is constructed primarily from motivational information (e.g., Freud's wishes, but also fears) and expectations derived from past experience about what is likely to be happening.

As a result, what happens in dreams, whether lucid or otherwise, is largely determined by what we expect. In ordinary dreams we are limited by our assumptions about what is possible derived from our past experience with physical reality. Since lucid dreamers know there is no gravity in dreams, there is nothing to prevent them from flying, and fly they do, with great delight.

Most people have experienced at least occasional and brief instances of lucid dreaming. In a common scenario, near the end of a nightmare, the dreamer realizes that "It's only a dream" and awakens with relief a few seconds later. However, dreamers who awaken to escape a nightmare, are probably only partially lucid. Fully lucid dreamers realize that the nightmare is as harmless as a horror film; thus they can decide to stay in the dream to face and successfully deal with their nightmare fears. If they choose this option, they will likely awaken with a little more self-confidence and perhaps, one less irrational fear. This approach appears highly promising as a method for overcoming nightmares.

Dreamers typically become lucid when they puzzle over oddities in dream content and conclude that the explanation is that they are dreaming. Although for most people lucid dreaming is a rare experience, there is reason to believe that it is a learnable skill (LaBerge, 1980a, b; LaBerge, 1985).

As Freud noted, it is possible to carry a specific mental set into sleep, such as intending to wake at a certain hour, or if the baby cries, or to remember dreams. Sleep is also compatible with the intention to have

lucid dreams, and several effective methods for inducing lucid dreams have been developed based on this approach. Diligent practice with some of these techniques has reportedly allowed highly motivated individuals with good dream recall to become lucid at will.

The impossible dream proved true

Although accounts of lucid dreaming go at least as far back as Aristotle, until recently, dream reports of this sort were received with considerable skepticism. The concept of "conscious sleep" can seem so paradoxical to certain ways of thinking that some philosophers have written books showing that "lucid dreaming" is an impossible absurdity. In the absence of objective proof, sleep researchers doubted that the dreaming brain was capable of such a high degree of mental functioning and consciousness.

In the late 1970s, the required proof was provided objectively observable voluntary eye movement signals. The technique was based on earlier studies by Dement and Roffwarg which found that the directions of eye movements recorded during REM sleep sometimes exactly corresponded to the directions that subjects reported they had been looking in their dreams. I (LaBerge, 1980a) reasoned that if lucid dreamers can act volitionally, they should be able to demonstrate volitional control by making a prearranged eye movement signal marking the exact time they became lucid. Using this approach, my colleagues at Stanford and I used a variety of voluntary signals to validate reports of lucid dreams in 5 subjects (LaBerge, 1980a; LaBerge, Nagel, Dement, & Zarcone, 1981a). All of the signals, and therefore lucid dreams, had occurred during uninterrupted REM sleep. See Figure 1. Replications in several other sleep laboratories have obtained nearly identical results.

In a series of further studies, we (LaBerge et al., 1981b) determined that dreamers typically became lucid either immediately after returning to REM sleep following a brief awakening (Figure 2), or more often (72% of SVLDs), at times of relatively intense brain activation during "phasic" REM sleep (Figures 1 and 3). In both cases, lucid dreams occur during unambiguous REM sleep rather than in some mixture of sleep and waking. Moreover, this is not a hypnogogic state or "light sleep" but intense, deep REM sleep (LaBerge, Levitan, & Dement, 1986). A study

with Andrew Brylowski and Lynne Levitan showed that lucid dreams are associated with heightened suppression of spinal reflexes (Figure 4). We also found that lucid dreams occur with greater frequency in later REM periods. It appears that lucid dreaming results from the conjunction of psychological and physiological factors: a sufficiently activated brain and an appropriate mental set. The required degree of brain activation normally appears to be attained only during phasic REM sleep, which may explain why stable lucid dreams have been rarely reported from other stages of sleep.

A parallel can be drawn (LaBerge, 1990) between the initially anomalous appearance of lucid dreaming and that of the state that has been called "paradoxical sleep" (i.e., REM sleep). When REM sleep was first discovered, its characteristics (e.g., highly activated brain, autonomic nervous system variability, and muscle atonia) contradicted the accepted notion of sleep as a passive state of rest, and thus required the expansion of our concept of sleep. The evidence associating lucid dreaming with REM sleep reviewed above would seem to require a similar expansion of our concept of dreaming and a clarification of our concept of sleep - lucid dreaming may well emerge as the most unexpected and remarkable feature of paradoxical sleep.

In my view, the many studies showing signal-verified lucid dreaming during REM sleep clearly indicate that REM sleep is under certain circumstances capable of supporting reflective consciousness. We took enormous care to show that these SVLDs occurred during unequivocal REM sleep (see Figures 1-4). Moreover, we have recorded over 100 SVLDs scored as REM sleep, and logically only one of these needs to have been correctly classified to confirm this potential of REM sleep. Hobson (2009) interpreted these results differently. Because he believes reflective consciousness is incompatible with REM dreaming, he supposes that lucid dreaming must be a dissociated hybrid mixture of waking and dreaming.

This might be a possible conclusion, if you accept the unproven premise (that no reflectively conscious states are REM), but even so, I think this manner of thinking is flawed, similar to arguing that because most mammals don't fly, bats, if they existed must be hybrid rat-birds. That's not quite what it's like to be a bat. Hobson cited a recent EEG study of lucid dreaming (Voss, Holzmann, Tuin, & Hobson, 2009), as supporting the

idea that lucid dreaming is a "dissociated" or "hybrid" state. However, the study does no more than assume its conclusion: As the first paragraph of the abstract states "Lucid dreaming is a dissociated state..." (p. 1191) The assumption behind this claim is that reflective consciousness indicates the presence of the waking state, and hence, lucid dreaming signals from REM sleep indicates the dissociative presence of "waking consciousness".

In the absence of any specific evidence for this dissociation hypothesis, we should prefer the alternative: drop the a priori assumption about REM sleep limitations, and accept that lucid dreaming shows that REM sleep can support full reflective consciousness. Also, experimental evidence (see below) has shown the frequent occurrence of self-reflection and other metacognitive processes during ordinary non-lucid dreaming (Kahan, LaBerge, Levitan & Zimbardo, 1997; Kahan & LaBerge, 2011). The essential difference between dreaming and waking is sensory input, not reflective consciousness (Kahan & LaBerge, 1996; Llinás & Paré 1991).

Scientific studies of dreaming consciousness

The eye-movement signalling methodology forms the basis for a powerful approach to dream research: Lucid dreamers can remember pre-sleep instructions to carry out experiments marking the exact time of particular dream events with eye movement signals, allowing precise correlations between the dreamer's subjective reports and recorded physiology, thereby enabling the methodical testing of hypotheses.

We employed this strategy in a series of studies at Stanford University demonstrating a striking degree of psychophysiological parallelism during lucid REM dreaming. In a study of dream time, subjects estimated ten second intervals during their lucid dreams. Signals marking the beginning and end of the subjective intervals allowed comparison with objective time. In all cases, time estimates during the lucid dreams were very similar to time estimates while awake, and likewise close to the actual time between signals (Figure 5). In short, it takes as long to do something in a dream as it does in waking life (LaBerge, 1980a, 1985). Thirty years later, these results were replicated and extended in a study presented at the Bial Foundation's 8th Symposium (Erlacher, Schredl & Gebhart, 2008). In another study, we asked trained lucid dreamers to either breathe rapidly

or to hold their breath (in their lucid dreams), marking the interval of altered respiration with eye movement signals (LaBerge & Dement, 1982). The polygraph recordings exactly corresponded to the reported patterns (Figure 6).

Other studies demonstrated that dreamed movements result in corresponding patterns of muscle twitching (Figure 1B), and that dreamed sexual activity is associated with physiological responses very similar to those associated with actual sexual activity.

We also found that we could distinguish dreaming and imagination physiologically by means of a visual tracking task (LaBerge & Zimbardo, 2000). We asked subjects to give the usual signal when they realized they were dreaming, then to slowly and smoothly move their finger, held at arms length, in a circle about 20 degrees wide, centered in the visual field, while tracking the tip of the finger. They also did the tracking task while awake with eyes open ("perception") and eyes closed ("imagination"). Figure 7 shows a typical result. As the example shows, imagination was much more likely to show rapid, saccadic eye movements, while dreaming and perception showed predominately slow, smooth tracking eye movement. The obvious (and statistically significant) differences in tracking presumably reflect corresponding differences in visual vividness, with dreaming and waking perception both being more subjectively vivid than visual imagination.

The results of these and other similar studies can be summarized as follows: dreamed experiences produce effects on the dreamer's brain (and to a lesser extent, body) remarkably similar to the physiological effects that are produced by actual experiences of the corresponding events while awake. If it were not for the fact that most of our muscles are paralyzed during REM sleep, we would actually do what we dream we are doing. Perhaps this explains in part why we are so inclined to mistake our dreams for reality: To the brain processes that construct our experiential model of the world, dreaming of perceiving or doing something is equivalent to actually perceiving or doing it.

Can we be confidant that the psychophysiological results found during lucid dreams generalize to non-lucid dreams? Why should having a particular belief "I am dreaming" or "I am awake" change the way the brain is wired? Note the eye-movement signals in Figure 1: there is the

same precise correspondence between reported gaze and recorded eye-movement for the signals whether during the lucid (Figure 1: 1, 3, and 4) or non-lucid (Figure 1: 2) parts of the dream.

Lucid and non-lucid dreams only need differ in one respect: the defining presence or absence of the explicit thought that one is dreaming. Dream cognition might otherwise be more or less coherent and rational, whether or not the dream fits the criterion of "lucid" or not. For example, you might realize you are dreaming but still believe that you need to evade a frightening dream-figure. On the other hand, you may make reasonably rational decisions within the limited context of a non-lucid dream. This same generalization applies as well to waking and dreaming: cognitive clarity varies in both states.

Dreaming and waking experience compared

It is frequently assumed that waking and dreaming experiences are completely distinct, e.g. with dreams being characterized by lack of reflection, attentional control, and ability to act deliberately. However, this characterization of dreams as single-minded and non-reflective is flatly contradicted by the evidence. In recent studies directly comparing reports from waking and dreaming, my colleagues and I found that compared to waking experiences, dreaming slightly more frequently contained public self-consciousness and emotion, and slightly less frequently contained deliberate choice (Kahan, LaBerge, Levitan & Zimbardo, 1997; Kahan & LaBerge, 2011). However, no significant differences between dreaming and waking were found for other cognitive activities, and none of the measured cognitive functions were typically absent or rare in dreams. In particular, nearly identical levels of reflection were reported in both states.

The fact that dreams contain sudden shifts of characters and scenes of which the dreamer takes little note is sometimes cited as evidence for a cognitive deficiency in dreaming. The presumption is that if this occurred in waking, one would immediately notice and attempt to understand the discontinuity. However, this assumption is unwarranted, as recent studies of "change blindness" show that people are far less likely to detect environmental changes than common sense assumes. I am not saying that there are no differences between dreams and waking experiences.

For example, the dream world is much less stable than the waking world, because the dream lacks the stabilization of an external structure ("physical reality"). Likewise, one can violate the laws of physics and society in dreams without the usual consequences. But the absence of sensory constraint is the only essential difference. One might or might not know that one is dreaming and it would still be a dream. And whatever differences there may be, I believe they are more alike than they are different. Havelock Ellis put it like this: "Dreams are real while they last. Can we say more of life?"

The future of dreaming

In conclusion, I would like to say something of the possible applications (cf. LaBerge & Rheingold, 1990) and implications of the lucid dreaming state. Through the process of cultural transmission humans today have come into possession of remarkable range of abilities that far surpass their biological cousins. I mean such areas of human endeavor as language, literacy, poetry, music, dance, science, mathematics, and the philosophical search for meaning. I believe that lucid dreaming should be added to this list of cultural achievements.

In addition to providing, as described above, an effective way to carry out scientific explorations of the dream state, consciousness, and mind-body relationships, lucid dreaming also appears to possess considerable potential for a variety of other applications, which include aiding inner growth, rehearsal and practice of new athletic, artistic, and social skills, overcoming nightmares, improving mental health, facilitating creative problem solving, and (as shown by Dream Yoga) opening the mind to the possibilities of higher development.

Of course, the broadest appeal of lucid dreaming is likely to be that Holy Grail of virtual reality, the fantasy-come-true of being able to have any imaginable experience. Even if this degree of control proves beyond all but the most talented and experienced dreamers, lucid dreams are still undeniably rewarding, and sought-after experiences. In contrast to non-lucid dreams, which according to several studies are typically characterized by mild anxiety, emotions in lucid dreams are usually positive, ranging from mild exhilaration to deeply meaningful, ecstatic peak experiences.

What currently limits the number of lucid dreamers to a growing minority is that while lucid dreaming is a learnable skill (LaBerge, 1980b), it takes time and effort. Hence a major line of our research has been developing techniques and technology to make lucid dreaming more easily accessible. The "Model-A" of this emerging "oneirotechnology" is the NovaDreamer, a biofeedback device that gives cues during REM sleep reminding users that they are dreaming (LaBerge & Levitan, 1995). New, increasingly effective, lucidity induction devices are under development, bringing closer the dream of a personal world simulation for everyone. Perhaps this is how the Startrek "Holodeck" of science fiction will become a reality.

Dreams have long been regarded as a wellspring of inspiration in nearly every field of human endeavor, from literature to science, engineering, painting, music, and sports. August Kekulé's dream of a snake biting its own tail, to take just one example, inspired his discovery of the previously unsuspected ring structure of benzene. In the past, we have had little or no control over the occurrence of creative dreams. But it now seems possible that the fantastic and heretofore unruly creativity of the dream state might be brought within our conscious control by means of lucid dreaming. As Kekulé urged his colleagues on the occasion of presenting his dream inspiration to a scientific convention in 1890: "Let us learn to dream...". Doing so, may well take us beyond and behind the brain.

References

Brylowski, A., Levitan, L., & LaBerge, S. (1989). H-reflex suppression and autonomic activation during lucid REM sleep: A case study. Sleep, 12, 374-378.

Hobson, J.A. (2009). The neurobiology of consciousness: Lucid dreaming wakes up. *International Journal of Dream Research*, 2, 41-44.

Kahan, T.L. & LaBerge, S., (1996). Cognition and metacognition in dreaming and waking: Comparisons of first and third-person ratings. *Dreaming,* 6, 235-249.

Kahan, T.L., LaBerge, S., Levitan, L., & Zimbardo, P. (1997). Similarities and differences between dreaming and waking: An exploratory study. *Consciousness & Cognition*, 6, 132-147.

Kahan, T.L., & LaBerge, S.P. (2011). Dreaming and waking: Similarities and differences revisited. *Consciousness and Cognition.* 20, 494-514.

LaBerge, S. (1980a). Lucid dreaming: An exploratory study of consciousness during sleep. *Unpublished doctoral dissertation, Stanford University, California.*

LaBerge, S. (1980b). Lucid dreaming as a learnable skill: A case study. *Perceptual and Motor Skills*, 51, 1039-1042.

LaBerge, S. (1985). *Lucid dreaming. Los Angeles: J. P. Tarcher*.

LaBerge, S. (1990). Lucid dreaming: Psychophysiological studies of consciousness during REM sleep. In R.R. Bootsen, J.F. Kihlstrom, & D.L. Schacter (Eds.), *Sleep and Cognition. Washington, D.C.: American Psychological Assoc.* (pp. 109-126).

LaBerge, S. (1998). Dreaming and consciousness. In S. Hameroff, A. Kaszniak, & A. Scott (Eds.), Toward a science of consciousness II (pp. 495-504). Boston: MIT.

LaBerge, S. (2000). Lucid dreaming: Evidence and methodology. In E. F. Pace-Schott, M. Solms, M. Blagrove, & S. Harnad (Eds.), Sleep and Dreaming: Scientific advances and reconsiderations (pp. 173-176). Cambridge: Cambridge University Press.

LaBerge, S., & Dement, W.C. (1982). Voluntary control of respiration during REM sleep. *Sleep Research*, 11, 107.

LaBerge, S., & Levitan, L. (1995). Validity established of DreamLight cues for eliciting lucid dreaming. *Dreaming*, 5, 159-168.

LaBerge, S., Levitan, L., & Dement, W. (1986). Lucid dreaming: Physiological correlates of consciousness during REM sleep. *J. of Mind & Behavior*, 7, 251-258.

LaBerge, S., Nagel, L., Dement, W.C., & Zarcone, V., Jr. (1981a). Lucid dreaming verified by volitional communication during REM sleep. *Perceptual and Motor Skills*, 52, 727-732.

LaBerge, S., Nagel, L., Taylor, W., Dement, W.C., & Zarcone, V., Jr. (1981b). Psychophysiological correlates of the initiation of lucid dreaming. *Sleep Research,* 10, 149.

LaBerge, S., & Rheingold, H. (1990). Exploring the world of lucid dreaming. New York: *Ballantine*.

LaBerge, S. & Zimbardo P.G. (2000). Smooth tracking eye-movements discriminate both dreaming and perception from imagination. Toward a Science of Consciousness Conference IV, Tucson, April 10, 2000. <http://lucidity.com/Tucson2000abs.html>

Llinás, R. & Paré, D. (1991). Of dreaming and wakefulness. *Neuroscience*, 44, 521-535.

Voss, U., Holzmann, R., Tuin, I., & Hobson, J.A. (2009) Lucid dreaming: a state of consciousness with features of both waking and non-lucid dreaming. *Sleep*, 32, 1191-1200.

Figures

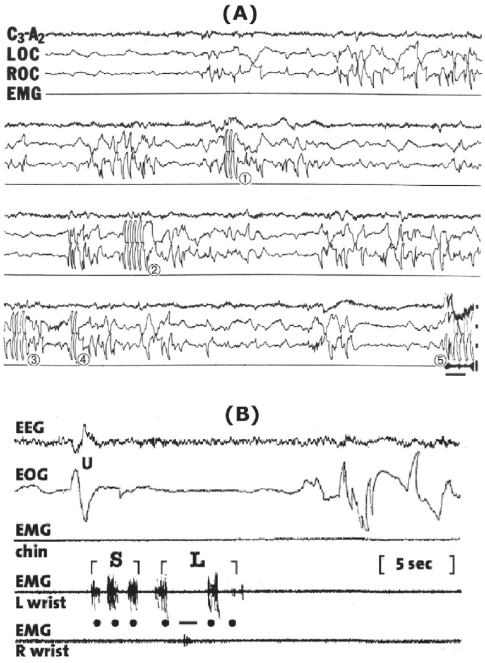

Figure 1. (A) Voluntary eye-movement signaling validates report of lucid dreaming during uninterrupted REM sleep. Four channels of physiological data [central EEG (C3-A2), left and right eye movements (LOC and ROC), and chin muscle tone (EMG)] from the last 8 minutes of a 30-minute REM period are shown. Upon awakening, the subject (S) reported having made five eye-movement signals (labeled 1-5). The first signal (1, LRLR) marked the onset of lucidity. Emotional sweating artifacts can be observed in the EEG at this point. During the following 90 seconds the S "flew about," exploring his dream world until he believed (falsely) he had awakened, at which point he made the signal for being awake (2, LRx4). After another 90 sec, the S realized that he was still dreaming and signaled (3) with three pairs of eye movements. Realizing that this was too many, he correctly signaled with two pairs (4) of eye-movements. Finally, upon awakening 100 seconds later, he signaled appropriately (5, LRx4). **(B)** Morse code communication from the lucid dream. Evidence of voluntary control of other muscle groups during REM was found by LaBerge, Nagel, Dement, and Zarcone (1981) while testing a variety of lucidity signals. We observed that a sequence of left and right dream-fist clenches resulted in a corresponding sequence of left and right forearm twitches as measured by EMG. Here the S sends a Morse code signal with left and right fist clenches corresponding to dots and dashes, respectively. Hence the message translates as "SL" (... .-..), the S's initials.

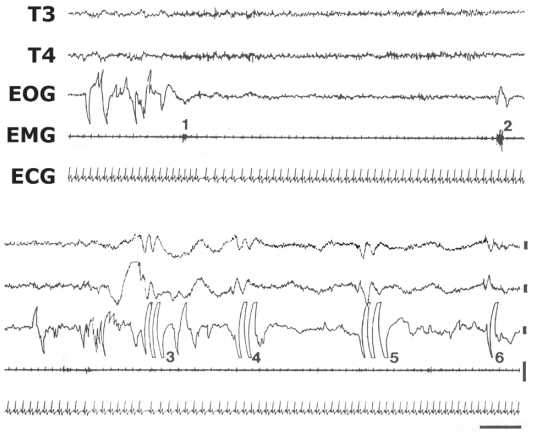

Figure 2. A lucid dream initiated from a transient awakening during REM (WILD). Five channels of physiological data (left and right temporal EEG [T3 and T4], horizontal eye-movement [EOG], chin muscle tone [EMG], and electrocardiogram [ECG]) from the last 3 min of a 14 min REM period are shown. The Subject (S) abruptly awoke during a REM-burst at (1). The onset of the 40 seconds of wakefulness is marked by a twitch in the EMG, a distinctive 2 - phase pattern of heart rate acceleration - deceleration, a cessation of eye-movements, and the appearance of continuous alpha-rhythm in the EEG. S reported having been accutely and uncomfortably aware of being awake at this moment; he was anxious about the fact that he had not yet had a lucid dream that night, and the hour was late - perhaps too late? Then, suddenly, he was flying high above a field! All doubt vanished instantly: This was lucid dreaming. He immediately made a lucidity signal (LRLR) at (3) and began the scheduled experimental task, singing between signals 3 and 4, and counting between signals 4 and 5. This allowed comparison of left and right hemisphere activation during the two tasks (LaBerge and Dement, 1982b). The thrilling transition to lucidity (3) is accompanied by a corresponding orientation response (OR), here visible in a biphasic heart-rate response similar to that shown on awakening (1), as well as a large emotional sweating (skin potential) artifact in the EEG (particularly T4/A2). These ORs are common at the onset of lucid dreams. [Calibrations are 50 μV and 5 s.]

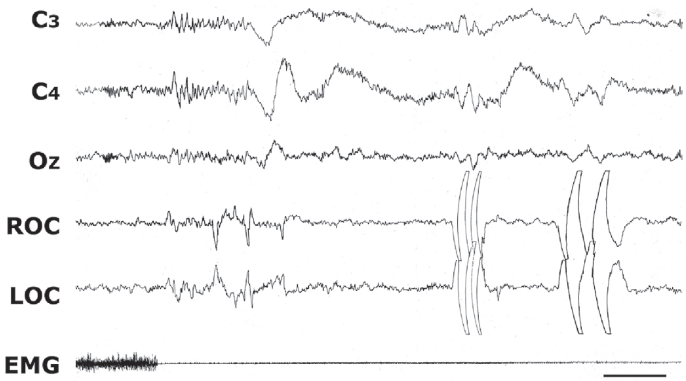

Figure 3. A signal-verified lucid dream initiated during the first thirty seconds of the first REM period of the night. Note the sleep spindles and elevated EMG indicating NREM Stage-2 at the beginning of the record, with distinct and sharp transition to REM Stage-1 (EMG suppression, saw-tooth waves, and rapid eye movements). Six channels of physiological data are shown: EEG from left and right central locations, (C3, C4); midline occipital, (Oz), EOG from right and left outer canthus (ROC and LOC), and submental (chin) muscle tone (EMG). Upon awakening, the subject reported dreaming that the phone rang; he answered it and became lucid, and immediately made two sets of LRLR eye-movement signals, the first following the agreed-upon procedure, and the second out of sheer enthusiasm. It is a truely "out of this world" experience to communicate in real-time with another person from inside your dream. Calibrations are 50 μV and 5 seconds.

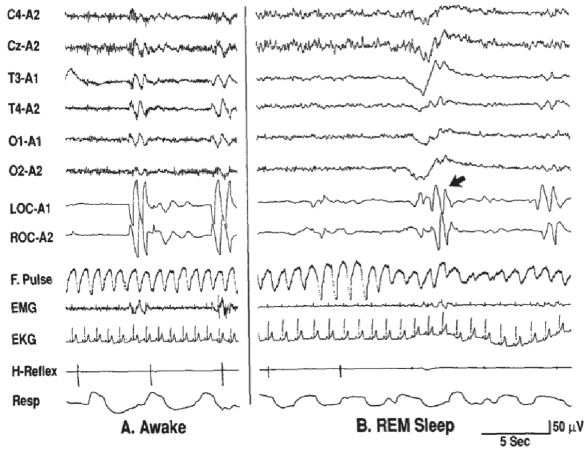

Figure 4. H-reflex suppression during lucid dreaming. Supporting the idea that lucid dreams occur during a deepened and intensified variety of paradoxical sleep rather than a lighter state of near-waking, H-reflex amplitude (a measure of spinal reflex excitability) is lower during lucid- compared to non-lucid REM (Brylowski, Levitan, & LaBerge, 1989). Note that compared to Wake (A.), H-reflex amplitude is reduced in REM sleep (B.), and completely abolished at the onset of lucid dreaming (arrow).

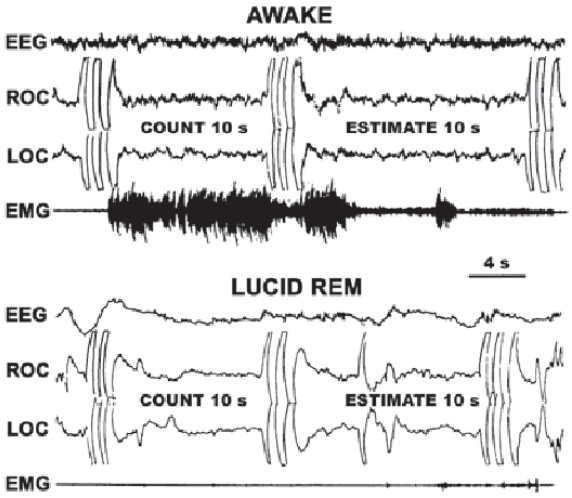

Figure 5. Dream time estimations. Subjects estimated ten-second intervals by counting, "one thousand and one, one thousand and two, etc." (between first and second signals), and without counting (between second and third signals), while awake (top panel) and during lucid dreams (bottom panel). Eye-movement signals marking the beginning and end of the subjective intervals allowed comparison with objective time. In all cases, time estimates during the lucid dreams were very similar to estimates while awake, and close to the actual duration between signals (LaBerge, 1980a, 1985).

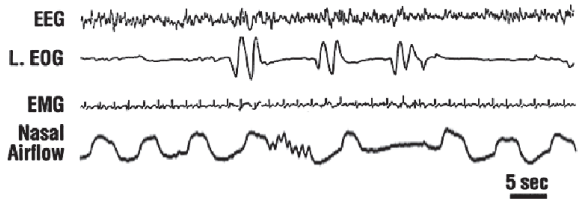

Figure 6. Voluntary control of respiration during lucid dreaming. LaBerge and Dement (1982) recorded three lucid dreamers who were asked to either breathe rapidly or to hold their breath (in their lucid dreams), marking the interval of altered respiration with eye movement signals as shown in the figure.

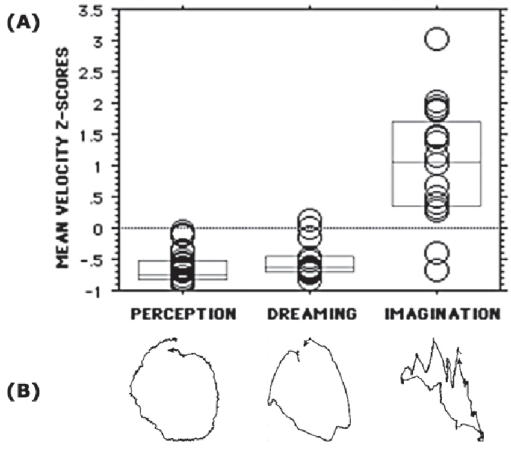

Figure 7. Smooth eye-movement tracking discriminates perception and lucid dreaming from imagination. Subjects visually followed their right index finger as they moved it clockwise or counter-clockwise in a circle centered in the visual field. Each of 6 lucid dreamers carried out the tracking tasks in the three states of consciousness, marking the onset and offset of tracking by a LRLR eye-movement signal. During the PERCEPTION condition, they followed the actual movement of their fingers with eyes open; during IMAGINATION and (lucid) DREAMING, their eyes were closed and they tracked purely phenomenal images of their fingers. (A) Mean values of standardized eye-movement velocities (EMVZ) for PERCEPTION, (lucid) DREAMING, and IMAGINATION. A discriminant function correctly classified 100% of PERCEPTION cases and 85% of IMAGINATION cases. All cases of lucid DREAMING were classified as PERCEPTION. The grey boxes contain 50% of the data, with median values, 75th and 25th percentiles marked. (B) An example of one subject's performance of the counter-clockwise motion in the three conditions. Note the relatively smooth tracking of PERCEPTION and DREAMING contrasted with the jerky saccadic eye movements of IMAGINATION.

In summary, using mean eye movement velocity alone, we were able to correctly classify 95% of the cases, strongly supporting our hypothesis that as far as the visual vividness dimension is concerned, dreaming consciousness is nearly identical to waking perceptual consciousness, and just as distinct from imagination as imagination is distinct from perception. [LaBerge & Zimbardo, 2000]

POSTER APRESENTADO PELA
FUNDAÇÃO BIAL
POSTER PRESENTED BY THE BIAL
FOUNDATION

Resumo de poster apresentado pela Fundação Bial
Abstract of the poster presented by the Bial Foundation

SEARCHING FOR THE HISTORY OF BIAL FOUNDATION GRANTS

Lima, M.T.[1], Berény, S.[2]

Aim: The aim of this study was to create a database identifying the subareas of psychophysiology and parapsychology funded by the Bial Foundation (BF) between 1994 and 2010 and at the same time using standard bibliometry methods to evaluate the quality of the publications resulting from the funded work.

Methods: Qualitative subareas of psychophysiology and parapsy chology were identified through a study of full papers, books and direct contact with researchers.

A database was created including all the publications divided by subareas and grants.

Full papers were analyzed by standard bibliometric methods using the ISI Web of Knowledge and Scopus.

As a result of the above, a single database was built with all the information collected in 1-3.

Results: In the period studied (1994-2010) the Bial Foundation supported 387 projects. Of these, 44.2% (n=171) were exclusive of psychophysiology, 41.3% (n=160) were exclusive of parapsychology and 14.5% (n=56) fell within the two areas. Only 2.1% grants failed (n=8). From all the publications, nearly 450 were full papers, out of which 163 published in indexed international journals with an average impact factor of 3.9 and a substantial number of citations (1252 in November 2011). 24 papers were published in journals with an impact factor above 5. In the full

1 Institute for Molecular and Cell Biology (IBMC), University of Porto, Portugal.
2 Faculty of Psychology and Educational Sciences, University of Porto, Portugal.

poster a detailed graphic presentation of the results will be made available.

Conclusion: The present study represents the first thorough quantitative analysis and standard evaluation of the quality of the work supported by the Bial Foundation since 1994. The results will enable the BF to design and stimulate future research projects.

Keywords: Bial Foundation grants, psychophysiology, parapsychology, database, bibliometry

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2004

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Instituição/*Institution:* Harvard Biological Laboratories, Cambridge - USA
Duração/*Duration:* 2006/01 - 2010/08
Investigadores/*Researchers*: Prof. Florian Engert, Dr. André Valente, Dr. Bettina Reiter, Dr. Johann Bollmann, Dr. Adam Kampff, Doctor Michael Orger

2006

01/06 - "Automated testing for telepathy using emails and telephone calls" – only abstract available
Instituição/*Institution:* Perrot-Warrick Project, London - UK
Duração/*Duration:* 2007/10 - 2010/06
Investigadores/*Researchers*: Prof. Rupert Sheldrake, Ms. Pamela Smart, Dr. David Luke

44/06 - "Brain Electric Activity in Meditation: Extension of Earlier Work and Hypothesis Testing"
Instituição/*Institution:* The KEY Institute for Brain-Mind Research, University Hospital of Psychiatry, Zurich - Switzerland
Duração/*Duration:* 2007/10 - 2011/01
Investigadores/*Researchers:* Prof. Dietrich Lehmann, Mr. Shisei Tei, Dr. Pascal Faber, Prof. Hiraoki Kumano, Dr. Lorena Gianotti, Dr. Roberto Pascual-Marqui

64/06 - "Brain Imaging Study of the Psychological Antecedents and Neural Correlates of Moral Judgement"
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Instituição/*Institution:* IBILI - Faculdade de Medicina, Universidade de Coimbra - Portugal
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Investigadores/*Researchers:* Dr. Marieke van Asselen, Prof. Albert Postma, Prof. Doutor António Freire Gonçalves, Dr. Inês Almeida, Dr. José Rebola

93/06 - "Exploring the relationship between susceptibility to false memories and belief in and experience of the paranormal"
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Duração prevista/*Estimated duration:* 2010/02 - 2012/03
Investigadores/*Researchers*: Prof. Christopher Charles French, Dr. Krissy Wilson

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Investigadores/*Researchers*: Dr. Marta de Aragão Pacheco Moita, Dr. Marta Guimarães

144/06 - "Event-related brain potential correlates of conscious and non-conscious processing in anxiety"
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Duração/*Duration:* 2007/10 - 2010/11
Investigadores/*Researchers:* Dr. Anne Richards e Dr. Amanda Holmes, Dr. Emily Hannon

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Instituição/*Institution:* Rhine Research Centre, Durham, North Carolina - USA
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Investigador/*Researcher:* Prof. William Joines

169/06 - "Exploring the relationship between paranormal belief, the propensity to make the type I error and the detection of paranormal and weak signals amid visual and auditory noise" – only abstract available
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2008

15/08 - "Psi information system software design for parapsychological research: SIPSI v.3.0: references, bibliometry research and video-DVD collection database"
Instituição/*Institution:* Instituto de Psicologia Paranormal, Buenos Aires - Argentina
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Investigadores/*Researchers:* Dr. Alejandro Enrique Parra, Sr. Alejandro Jarandilla, D. Teresa Porcel, Sr. Bernardo Olivares Torres, Sr. Jorge Villanueva

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Duração prevista/*Estimated duration:* 2009/01 - 2012/03
Investigadores/*Researchers:* Prof. Maria de São Luís de Vasconcelos Fonseca e Castro Schöner, Dr. Armando César Ferreira Lima, Prof. António José de Bastos Leite, Prof. Maria Carolina Lobo Almeida Garrett

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Investigadores/*Researchers:* Prof. Jose Luis Perez Velazquez, Dr. Richard Wennberg, Dr. Luis Garcia Dominguez

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Instituição/*Institution:* Dept. of Applied Social Sciences, Canterbury Christ Church University - UK -, University of East Anglia Norwich - UK-, Dept. of Psychology, Avila University, Kansas City - USA - Siberian Branch of the Russian Medical Academy, State Institute for Molecular Biology and Biophysics, Nonvosibirsk - Russia
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Investigadores/*Researchers:* Dr. Thilo Hinterberger, Dr. Niko Kohls

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94/08 - "Manipulação da Emoção em Ambientes de Realidade Virtual Imersiva: Validação Metodológica" - "Emotion manipulation in environments of immersive virtual reality: methodological validation"
Instituição/*Institution:* UnIPSa – Unidade de Investigação em Psicologia e Saúde: Laboratório de Psicofisiologia / Grupo de Psicobiologia / Instituto Superior de Ciências da Saúde – Norte, Paredes - Portugal
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122/08 - "Mindfulness and emotional factors contributing to intuitive decision-making in the medical settings"
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Investigadores/*Researchers:* Prof. Henk Barendregt, Dr. Stephen Whitmarsh, Dr. Eva Lobach, Prof. Dick J. Bierman, Dr. Fabio Giommi

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Investigadores/*Researchers:* Prof. Teresa Freire, Dr. Mário João Pereira Sequeira Santos, Prof. Marta Bassi, Dr. Gabriela Matias

134/08 – "How does cognitive enrichment impact on neuronal networks and behavioral performance?"
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148/08 - "Design and Testing of a Wearable Device for Neurofeedback of Physiological Correlates to States of Consciousness"
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Duração/*Duration:* 2009/04 - 2011/03
Investigador/*Researcher*: Dr. Thilo Hinterberger

149/08 - "A closer look at meditation: Challenging the attentional network on different types of meditative procedures"
Instituição/*Institution:* for Mindfulness, Meditation and Neuroscience Research, Institute of Environmental Health Sciences, University Medical Center Freiburg - Germany
Duração/*Duration:* 2010/04 - 2011/09
Investigadores/*Researchers:* Prof. Stefan Schmidt, Prof. Harald Walach, Dr. Thilo Hinterberger, Dr. Matthias Braeunig, Dr. Jose Raul Naranjo and Dr. Kathrin Simshäuser

159/08 - "Developing a "Recipe" for Success in ESP Experimental Research (Phase III): Integrating Psi-conducive Practices"
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Duração/*Duration:* 2009/01 - 2011/01
Investigador/*Researcher:* Dr. Jose M. Perez Navarro

162/08 - "Meditation at the core: neuroscientific comparison of attentional resource allocation in different meditation practices" – only abstract available
Instituição/*Institution:* CERCO, Centre de Recherche Cerveau et Cognition, Toulouse - France
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Investigadores/*Researchers:* Dr. Arnaud Delorme, Dr. Claire Braboszcz, Dr. Romain Granchamps, Dr. Rael Cahn, Dr. Emmauel Fernandez

169/08 - "When Rejection Hurts: Probing the Neural Basis of Childhood Social Exclusion with a Dense-array EEG"
Instituição/*Institution:* Yale Child Study Center, New Haven - USA
Duração/*Duration*: 2009/02 - 2011/09
Investigadores/*Researchers:* Dr. Michael J. Crowley, Prof. Linda C. Mayes, Dr. Christopher A. Bailey

176/08 - "How do we choose a partner? Neural circuits involved in inbreeding avoidance and mate selection"
Instituição/*Institution:* Instituto Gulbenkian de Ciência, Oeiras - Portugal
Duração/*Duration:* 2009/02 - 2011/03
Investigadores/*Researchers:* Dr. Susana Sá Couto Quelhas Lima, Dr. Léa Zinck

183/08 - "Communication in shared altered states using the hypnotic and Ganzfeld induction of lucid dreams"
Instituição/*Institution:* University of Gothenburg, Psychology Department: Consciousness Studies Unit - Sweden
Duração prevista/*Estimated duration:* 2009/03 - 2012/03
Investigadores/*Researchers:* Prof. Adrian Parker, Dr. Annekatrin Puhle, Dr. Amanda Sondefors, Dr. Andreas Lantz, Dr. Timo Paulson

200/08 - "The Effect of Paranormal Belief and Cognitive-Perceptual Factors on Mnemonic Performance: An Experimental Investigation"
Instituição/*Institution:* The Manchester Metropolitan University (MMU), Research Institute of Health and Social Change, Faculty of Health, Social Care & Education, Division of Psychology and Social Change, Manchester - UK
Duração/*Duration:* 2009/08 - 2011/09
Investigadores/*Researchers:* Dr. Neil Andrew Dagnall, Dr. Andrew Parker, Dr. Gary Munley

201/08 - "Posterior Parietal Cortex Involvement in Skill Learning"
Instituição/*Institution:* Laboratory of Neurobiology of Human Behavior of Hospital de Santo António, Porto – Portugal - and Division of Behavioral Neurology and College of Medicine of the University of Iowa, Carver College of Medicine - USA
Duração prevista/*Estimated duration:* 2010/02 - 2012/03
Investigadores/*Researchers:* Prof. Sara Marta Pereira dos Santos Cavaco, Prof. Steven Wayne Anderson, Dr. Pedro Soares Pinto, Dr. Ricardo Taipa

2010

27/10 – "From Trance to Transcendence during Meditation"
Instituição/*Institution:* The Leslie and Susan Golda (Goldschmied) Multidisciplinary Brain Research Center, Bar-Ilan University, Ramat Gan - Israel
Duração prevista/*Estimated duration:* 2011/06 - 2012/07
Investigadores/*Researchers:* Prof. Joseph Glicksohn, Dr. Abraham Goldstein, Dr. Aviva Berkovich Ohana

40/10 – "Psychophysiological investigations of interference resolution during memory retrieval" – only abstract available
Instituição/*Institution:* Cardiff University Brain Research Imaging Centre (CUBRIC), School of Psychology, Cardiff - UK
Duração prevista/*Estimated duration:* 2011/05 - 2012/04
Investigadores/*Researchers*: Prof. Edward Wilding, Dr. Damian Cruse

45/10 – "Shamanic-Like Journeying and Psi-Hitting: Searching for the Psi-Conducive Component(s) of a Novel Experimental Protocol"
Instituição/*Institution:* Phoenix Institute of Victoria, Prahran - Australia
Duração prevista/*Estimated duration:* 2011/04 - 2012/03
Investigadores/*Researchers:* Dr. Adam Rock

57/10 – "Psychophysiological, behavioural and experiential responses to evoked positive and negative emotion in people with eating disorders" – only abstracts available
Instituição/*Institution:* King's College London, Institute of Psychiatry, London - UK
Duração prevista/*Estimated duration:* 2011/03 - 2012/03
Investigadores/*Researchers:* Dr. Kate Tchanturia, Dr. Helen Davies

82/10 – "An investigation into the prevalence and phenomenology of synchronicity experiences in the clinical setting"
Instituição/*Institution:* Centre for the Study of Anomalous Psychological Processes (CSAPP), The University of Northampton - UK
Duração prevista/*Estimated duration*: 2011/03 - 2012/04
Investigador/*Researcher:* Dr. Elizabeth Roxburgh

139/10 – "Mobile Consciousness: Developing a Smartphone Application for REG Exploration and Distributed Consciousness Research"
Instituição/*Institution:* International Consciousness Research Labora-. tories, New Jersey - USA
Duração prevista/*Estimated duration:* 2011/03 - 2012/03
Investigadores/*Researchers:* Prof. Robert G. Jahn, Adam M. Curry, Hale Brownlee, Dr. Brenda J. Dunne

142/10 – "Towards a Replicable Formula for Significant Intuitive Ability in an Applied Setting" – only abstract available
Instituição/*Institution:* Integrated Knowledge Systems, Illinois - USA
Duração prevista/*Estimated duration:* 2011/03 - 2012/03
Investigadores/*Researchers*: Dr. James Houran, Dr. Rense Lange

196/10 – "Emotional Responses in Patients with Disconnection of the Left and Right Brain Hemispheres"
Instituição/*Institution:* Caltech Emotion and Social Cognition Laboratory, California Institute of Technology, California - USA
Duração/*Duration:* 2011/04 - 2012/02
Investigadores/*Researchers:* Dr. Lynn Kerlin Paul, Prof. Ralph Adolphs, Remya Nair

PALESTRANTES E MODERADORES
SPEAKERS AND MODERATORS

CARLOS ALVARADO Professor residente, Universidade de Atlanta, Professor Assistente de Investigação em Medicina Psiquiátrica, Universidade de Virgínia, EUA. Membro do corpo editorial do *Journal of Near-Death Studies* e do *Journal of the Society for Psychical Research*, e Editor Associado do *Journal of Scientific Exploration*. É um dos editores da publicação *Research in Parapsychology* 1993 (Lanham, MD: Scarecrow Press, 1998) e autor de inúmeros artigos da maior exigência em publicações académicas e científicas. Interesses científicos: as características e psicologia de experiências fora do corpo e de outros fenómenos, e a história da parapsicologia.

Scholar in Residence at Atlantic University and Assistant Professor of Research in Psychiatric Medicine at the University of Virginia, USA. Member of the editorial boards of the Journal of Near-Death Studies and the Journal of the Society for Psychical Research, and Associate Editor of the Journal of Scientific Exploration. He is one of the editors of Research in Parapsychology 1993 (Lanham, MD: Scarecrow Press, 1998) and the author of numerous refereed papers in scholarly and scientific publications. Research interests: the features and psychology of out-of-body experiences and other phenomena and the history of parapsychology.

DICK BIERMAN Regente (Jubilado) da Cadeira Heymans de Experiências Excecionais, Universidade de Humanísticas, Utrecht, Holanda. Doutorado em Física Experimental, Universidade de Amesterdão, Holanda. Interesses científicos: estudos da consciência, inteligência artificial, aprendizagem sob estados modificados de consciência (em especial durante o sono), papel das emoções não conscientes na tomada (intuitiva) de decisão, pré-sentimento (excitação corporal anómala, que precede acontecimentos emocionais), relação entre a física quântica e consciência.

Heymans Chair of Exceptional Experiences, University for Humanistics, Utrecht, Netherlands (Emeritus). PhD in Experimental Physics, University of Amsterdam, Netherlands. Research interests: consciousness studies, artificial intelligence, learning during altered states of consciousness (especially during sleep), non-conscious emotions and their role in (intuitive) decision-making, pre-sentiment (anomalous body arousal preceding emotional events), relation between quantum physics and consciousness.

MIGUEL CASTELO-BRANCO Professor de Biofísica e Matemática e Ciências da Visão e Diretor do IBILI e ICNAS, Universidade de Coimbra. Vários prémios na área das Neurociências. Dezenas de artigos publicados na área da Bioengenharia, Neurociência da Visão e Neurociência Clínica. Consultor (*peer-reviewer*) de várias revistas científicas nas áreas de Neurociências e Ciências da Visão. Secretário científico da Sociedade Europeia EVER (Ciências da Visão). Interesses científicos: neurociências sensoriais e cognitivas em populações saudáveis e doentes.

Professor of Biophysics and Mathematics and Visual Sciences and Director of IBILI and ICNAS, University of Coimbra. Several awards on Neuroscience. Dozens of papers published on Bioengineering, Visual Neuroscience and Clinical Neuroscience. Consultant (peer-reviewer) for several journals on Neuroscience and Visual Sciences. Scientific Secretary of the European Society EVER (Visual Sciences). Research interests: sensory and cognitive neuroscience in healthy and ill populations.

ALEXANDRE CASTRO-CALDAS Professor de Neurologia, Diretor do Instituto de Ciências da Saúde da Universidade Católica Portuguesa, Lisboa. Foi Presidente da *International Neuropsychological Society*. Interesses científicos: literacia/iliteracia e ortografia e substratos neurobiológicos cerebrais, afasia e doença de Parkinson.

Professor of Neurology, Director of the Health Sciences Institute of the Catholic University of Portugal, Lisbon, Portugal. Past President of the *International Neuropsychological Society*. Research interests: literacy/illiteracy and orthography and brain neurobiological substrates, aphasia and Parkinson's disease.

AXEL CLEEREMANS Diretor de Investigação, Grupo da Consciência, Cognição e Computação, Universidade Livre de Bruxelas, Bélgica. Autor de múltiplos artigos científicos sobre aprendizagem implícita e consciência e editor dos livros "The Unity of Consciousness: Binding, Integration and Dissociation" e "The Oxford Companion to Consciousness". Membro da Real Academia da Bélgica. Interesses científicos: consciência e aprendizagem implícita, modelos de cognição consciente e não consciente, rede neuronal de processos cognitivos.

Research Director, Consciousness, Cognition & Computation Group, Université Libre de Bruxelles, Belgium. Author of numerous papers on implicit learning and consciousness and editor of the books "The Unity of Consciousness: Binding, Integration and Dissociation" and "The Oxford Companion to Consciousness". Member of the Royal Academy of Belgium. Research interests: consciousness and implicit learning, models of conscious and unconscious cognition, neural network of cognitive processes.

SALLY RHINE FEATHER Diretora Executiva do Rhine Research Center, Durham, NC, EUA. Doutorada em Psicologia Experimental. Prémio *Outstanding Career Award,* 2011, *Parapsychological Association*. Múltiplas publicações na área da Parapsicologia. Interesses científicos: aspetos históricos e biográficos de personalidades ligadas à Parapsicologia, experiências extraordinárias de pessoas comuns.

Executive Director, Rhine Research Center, Durham, NC, USA. Ph.D. in Experimental Psychology. Outstanding Career Award, 2011, Parapsychological Association. Multiple publications on Parapsychology. Research interests: historical and biographical aspects of Parapsychology figures, extraordinary experiences of ordinary people.

PÉTER HALÁSZ Diretor Jubilado do Centro de Epilepsia e Professor de Pós-Graduação em Epileptologia e Neurofisiologia Clínica no *National Institute of Psychiatry and Neurology*, Universidade de Budapeste, Hungria. Publicou mais de 200 artigos em revistas científicas, seis livros e foi membro do corpo editorial de várias revistas científicas em neurologia. Pioneiro na Hungria na área da medicina do sono e promotor de estudos em epileptologia, que lhe valeram o título de "Embaixador da Epilepsia". Interesses científicos: epileptologia, neurofisiologia clínica e investigação da dinâmica microestrutural do sono.

Emeritus Director of the Epilepsy Center and Professor of Post-graduation courses on Epileptology and Clinical Neurophysiology, National Institute of Psychiatry and Neurology, University of Budapest, Hungary. Published more than 200 articles in journals, six books and was member of several editorial boards of neurological journals. Pioneer in Hungary in the field of sleep medicine and promoter of studies in epileptology, which earned him the title of "Ambassador of Epilepsy". Research interests: epileptology, clinical neurophysiology and research in microstructural dynamics of sleep.

ALLAN HOBSON Professor Jubilado de Psiquiatria e Diretor do Curso em Ciência Básica do Sono e Sonhos, *Harvard Medical School*, Boston, EUA. Professor Visitante de várias Universidades Europeias. Vários prémios científicos por investigação de excelência, em especial na área do sono. Editor de várias publicações científicas na área das neurociências, em especial do sono. Autor ou coautor de livros e centenas de artigos científicos em neurociências, nomeadamente sobre investigação do sono. Interesses científicos: sono e sonho, bases neurofisiológicas da mente e comportamento, história da neurologia e psiquiatria.

Emeritus Professor of Psychiatry and Director of Basic Science Course on Sleep and Dreams, Harvard Medical School, Boston, USA. Visiting Professor of several European Universities. Several scientific awards for excellence in research, especially on sleep. Editor of numerous neuroscience journals, especially on sleep. Author or coauthor of books and hundreds of papers on neurosciences, namely about sleep research. Research interests: sleep and dream, neurophysiological basis of mind and behaviour, History of neurology and psychiatry.

STEPHEN LABERGE Leitor sobre Sono e Sonhos, Universidade de Stanford, EUA. Fundador, CEO e Diretor de Investigação, *The Lucidity Institute, Inc*, EUA. Cofundador da Associação para o Estudo dos Sonhos. Membro do corpo editorial de *Dreaming, Consciousness and Cognition* e de *Sleep and Hypnosis*. Consultor de diversas revistas científicas nas áreas da Psicologia e Consciência. Detém patentes para equipamento e substâncias, respetivamente, para induzir e evocar sonhos lúcidos. Autor e coautor de livros e artigos científicos sobre sonhos lúcidos. Interesses científicos: sonhos em geral, sonho lúcido e seus correlatos neurofisiológicos.

Lecturer on Sleep and Dreams, Stanford University, USA. Founder, CEO and Director of Research, The Lucidity Institute, Inc., USA. Co-founder of the Association for the Study of Dreams. Member of the editorial board of Dreaming, Consciousness and Cognition and of Sleep and Hypnosis. Consultant for several journals on Psychology and Consciousness. Holds patents for equipment and substances, respectively, to induce and evoke lucid dreams. Author and co-author of books and papers on lucid dreams. Research interests: dreams in general, lucid dreaming and its neurophysiological correlates.

FERNANDO LOPES DA SILVA Professor Jubilado de Fisiologia Geral, Universidade de Amesterdão, Holanda, Professor "IST" do Instituto Superior Técnico de Lisboa e Professor Convidado da Faculdade de Medicina da Universidade de Lisboa. Interesses científicos: eletrofisiologia do cérebro, origens do fenómeno epilético, redes neuronais em relação com a memória, atenção e consciência.

Emeritus Professor of General Physiology, University of Amsterdam, Netherlands, Professor "IST" of the Higher Technical Institute of Lisbon and Invited Professor of the Faculty of Medicine, University of Lisbon, Portugal. Research interests: electrophysiology of the brain, origin of epileptic phenomena, neuronal networks in relation to memory, attention and consciousness.

RUI MOTA CARDOSO Professor de Psicologia, Faculdade de Medicina, e Psiquiatra, Porto. Fundador da Sociedade Portuguesa de Psicossomática e da Sociedade Portuguesa de Psicodrama. Interesses científicos: relação terapêutica e medicina psicossomática.

Professor of Psychology, Faculty of Medicine, and Psychiatrist, Oporto, Portugal. Founder of the Portuguese Society of Psychosomatics and Portuguese Society of Psychodrama. Research interests: the therapeutic relationship and psychosomatic medicine.

TERESA PAIVA Professora Associada de Neurologia, Faculdade de Medicina, Universidade Clássica de Lisboa. Professora Associada Convidada do Instituto Superior Técnico, Lisboa. Investigadora do Instituto de Medicina Molecular, Lisboa.

Coordenadora do Mestrado em Medicina do Sono, Faculdade de Medicina, Lisboa. Detém três patentes para estudo da Medicina do Sono. Interesses científicos: medicina do sono, Psicofisiologia do sonho, Fibromialgia.

Associate Professor of Neurology, Faculty of Medicine, University of Lisbon. Invited Associate Professor of Instituto Superior Técnico, Lisbon. Researcher of the Institute of Molecular Medicine, Lisbon. Coordinator of the Master Degree in Sleep Medicine, Faculty of Medicine, Lisbon. Holds 3 national patents for the study of Sleep Medicine. Research interests: sleep medicine, Psychophysiology of dream, Fibromyalgia.

CHRISTOPHER A. ROE Leitor em Psicologia, Universidade de Northampton, Inglaterra. Diretor de investigação, Divisão de Psicologia e Vogal do Centro para o Estudo de Processos Psicológicos Anómalos, Universidade de Northampton. Diretor do Curso de Mestrado em Psicologia Transpessoal e Estudos da Consciência, Universidade de Northampton. Editor do *Journal of Society of Psychical Researh* (SPR) e vogal do Comité da Secção de Psicologia Transpessoal da *British Psychological Society* e do Conselho da SPR, Londres. Consultor de várias revistas científicas nas áreas da Parapsicologia, Consciência e Psicologia Cognitiva. Interesses científicos: fatores associados à crença no paranormal e experiências anómalas, psicologia da dissimulação (*deception*), correlatos psicológicos da execução de testes laboratoriais de perceção extrassensorial e psicocinese.

Reader in Psychology, University of Northampton, UK. Research Director, Psychology Division and member of the Centre for the Study of Anomalous Psychological Processes, University of Northampton. Course Leader for the MSc in Transpersonal Psychology and Consciousness Studies, University of Northampton. Editor of the Journal of the Society for Psychical Research (SPR) and Committee Member of the British Psychological Society Section for Transpersonal Psychology and Council Member of the SPR, London. Consultant of several journals on Parapsychology, Consciousness and Cognitive Psychology. Research interests: factors associated with paranormal belief and anomalous experiences, the psychology of deception, and psychological correlates of performance on laboratory-based tests of extrasensory perception and psychokinesis.

MICHAEL SCHREDL Professor na área do sono e sonho, Universidade de Manheim, Alemanha. Diretor do Laboratório de Investigação do Sono, *Central Institute of Mental Health*, Manheim. Publicação de centenas de artigos científicos e quatro livros sobre temáticas ligadas ao sono. Interesses científicos: continuidade entre a vigília e o sono, sonhos e psicopatologia, memória de sonhos, tratamento de pesadelos, sono REM e memória e síndroma das pernas inquietas.

Professor in the area of sleep and dream, University of Manheim, Germany. Head of the Sleep Laboratory Research, Central Institute of Mental Health, Mannheim. Published hundreds of scientific papers and four books on sleep topics. Research interests: continuity between waking and sleep, dreams and psychopathology, dream recall, treatment of nightmares, REM sleep and memory and restless legs syndrome.

SOPHIE SCHWARTZ Investigadora Sénior e Professora de Métodos em Neuroimagem e Programação. Diretora do Laboratório de Neuroimagem do Sono e Cognição, Vogal do Comité Executivo do Laboratório do Cérebro e Comportamento, Faculdade de Medicina, Universidade de Genebra, Suíça. Autora de livros de divulgação científica, na área do sono, para crianças. Autora de artigos científicos e capítulos de livros sobre neuroimagem do sono e sonho. Consultora e membro do corpo editorial de várias revistas científicas nas áreas do sono e cronobiologia. Interesses científicos: plasticidade neural no ser humano adulto, papel do sono e sonho na cognição, impacto das doenças psiquiátricas no processamento percetivo e atencional estudado por fMRI, atenção, aprendizagem visual e processamento precoce visual.

Senior researcher and Professor of Neuroimaging and Programming Methods. Head of the Laboratory for Neuroimaging of Sleep and Cognition, Member of the Executive Committee of the Brain and Behavior Laboratory, Faculty of Medicine, University of Geneva, Switzerland. Author of books of scientific communication, in the area of sleep, for children. Author of papers and book chapters on sleep and dream neuroimaging. Consultant and member of the editorial board of several journals on sleep and chronobiology. Research interests: neural plasticity in human adults, role of sleep and dream in cognition, impact of psychiatric disorders on attentional and perceptual processing as assessed by fMRI, attention, visual learning and early visual processing.

MÁRIO SIMÕES Professor de Psiquiatria e de Ciências da Consciência, Faculdade de Medicina de Lisboa. Diretor do Curso de Pós-Graduação em Hipnose Clínica e Experimental da Faculdade de Medicina de Lisboa. Interesses científicos: psicologia e psicofisiologia dos estados alterados de consciência, etnomedicina, experiências excecionais humanas e psicologia e espiritualidade.

Professor of Psychiatry and Consciousness Sciences, Faculty of Medicine of Lisbon, Portugal. Director of the Post-Graduation Course in Clinical and Experimental Hypnosis, Faculty of Medicine of Lisbon. Research interests: psychology and psychophysiology of altered states of consciousness, ethnomedicine, human exceptional experiences and psychology and spirituality.

KAI SPIEGELHALDER Investigador Residente e Associado no departamento de Psiquiatria e Psicoterapia, *University Medical Center*, Freiburg, Alemanha. Consultor da *Cognitive Therapy and Research, Journal of Sleep Research, Nature and Science of Sleep*. Prémio *Young Investigator Award 2008*, *German Sleep Research Society* e Prémio Marie Curie, *European Sleep Research Society*. Interesses científicos: medicina do sono e investigação sobre vários aspetos do sono.

Resident and Associate Researcher at the Department of Psychiatry and Psychotherapy, University Medical Center Freiburg, Germany. Consultant for Cognitive Therapy and Research, Journal of Sleep Research, Nature and Science of Sleep. Young Investigator Award 2008, German Sleep Research Society and Marie Curie Award, European Sleep Research Society. Research interests: sleep medicine and research on various aspects of sleep.

ROBERT STICKGOLD Professor Associado de Psiquiatria, *Harvard Medical School*, Boston, EUA. Vogal do *Harvard Standing Committee* em Mente, Cérebro e Comportamento. Editor associado do *Journal Mind and Matter*, e membro do corpo editorial de várias revistas científicas das áreas do sono e consultor de mais de dez revistas científicas nas áreas das Neurociências, Cronobiologia, Consciência, Sono e Sonho. Autor de dezenas de artigos e coautor de livros sobre Medicina do Sono. Interesses científicos: natureza e função do sono e sonhos na perspetiva da neurociência cognitiva, consolidação da memória e integração em pacientes sofrendo de esquizofrenia, perturbações do espetro autista e *stress* pós-traumático.

Associate Professor of Psychiatry, Harvard Medical School, Boston, USA. Member of the Harvard Standing Committee on Mind, Brain, and Behavior. Associate editor of the Journal Mind and Matter and member of the editorial board of several journals on sleep and consultant for more than ten journals on Neuroscience, Chronobiology, Consciousness, Sleep and Dream. Author of dozens of articles and co-author of books on Sleep Medicine. Research interests: nature and function of sleep and dreams from a cognitive neuroscience perspective, memory consolidation and integration in patients with schizophrenia, autism spectrum disorders and post-traumatic stress.

EUS VAN SOMEREN Professor de Neurofisiologia, Vrije Universiteit, Amesterdão, Holanda. Diretor do Departamento do Sono e Cognição, Instituto Holandês para a Neurociência, Academia Real de Artes e Ciências. Autor de centenas de artigos científicos em revistas altamente cotadas. Fundador de uma base de dados sobre sono, originada em voluntários, através da internet (*HYPERLINK* "http://www.sleepregistry.eu"www.sleepregistry.eu) e cofundador do *European Insomnia Network*. Interesses científicos: sono, ritmos circadianos, cognição, envelhecimento, termorregulação, imagiologia e aquisição de séries temporais fisiológicas e comportamento.

Professor of Neurophysiology, Vrije Universiteit, Amsterdam, Netherlands. Head of the Department of Sleep and Cognition, Netherlands Institute for Neuroscience, Royal Academy of Arts and Sciences. Author of hundreds of papers in journals of high impact. Founder of an internet sleep registry (HYPERLINK "http://www.sleepregistry.eu"www.sleepregistry.eu) database with many volunteers, and co-founder of the European Insomnia Network. Research interests: sleep, circadian rhythms, cognition, ageing, thermoregulation, imaging and acquisition of physiological and behavioral time-series.

CAROLINE WATT Investigadora Sénior Perrott-Warrick e Docente Sénior, Departamento de Psicologia, Universidade de Edimburgo, Escócia. *Past President* da *Parapsychological Association*, coautora do livro "An Introduction to Parapsychology" e autora de artigos em livros e revistas científicas na área da parapsicologia e de crenças paranormais. Interesses científicos: a psicologia e parapsicologia de experiências de sonhos pré-cognitivos, efeitos da expectativa do experimentador e do participante.

Perrott-Warrick Senior Researcher, and Senior Lecturer, Psychology Department, University of Edinburgh, Scotland. Past President of the Parapsychological Association, co-author of the book. "An Introduction to Parapsychology" and author of journal articles on parapsychology and paranormal beliefs. Research interests: the psychology and parapsychology of precognitive dream experiences, experimenter and participant expectancy effects.

Posters com resultados finais apresentados pelos bolseiros da Fundação Bial
Posters with final results presented by the Bial Foundation Fellows

2004

115/04 - "Psychophysiological Analysis of Learning and Memory using Zebrafish as an in vivo Model System"
Instituição/*Institution*: Harvard Biological Laboratories, Cambridge - USA
Duração/*Duration*: 2006/01 - 2010/08
Investigadores/*Researchers*: Prof. Florian Engert, Dr. André Valente, Dr. Bettina Reiter, Dr. Johann Bollmann, Dr. Adam Kampff, Doctor Michael Orger

Objectives: The zebrafish (*Danio rerio)* has been an excellent vertebrate model for genetic analysis of early development and has also been used to study aspects of neural development and function. It is known that fish exhibit a wide range of learning behaviors but it is not clear at what point during development they begin nor have these behaviors been analyzed systematically. Before moving on to *in vivo* 2-photon imaging of neural circuitry, we are answering questions related to the *ontogenesis of the learning and memory behaviors we assay for* – When do animals start learning and how does that correlate to their developmental biology and age range? How does the ability to learn correlate with it's persistence and extinction?

Methods: The performance of developing zebrafish in both classical and operant conditioning assays was tested with a particular focus on the emergence of these learning behaviors during development. Strategically positioned visual cues paired with electro- shocks were used in two fully automated assays to investigate both paradigms. These allow the evaluation of the behavioral performance of zebrafish continuously throughout development, from larva to adult.

Results: We found that learning improves throughout development, starts reliably around week 3, and reaches adult performance levels at week 6. Adult fish quickly learned to perform perfectly, and the expression of the learned behavior is manifestly controlled by vision. The memory is behaviorally expressed in adults for at least 6 h and retrievable for at least 12 h.

Conclusions: We have developed a computer-based automated behavioral assay which we can easily control and comprehensively analyze. Using this automated system we show that a strong ability to learn is already present in young juvenile fish and we further characterize the ontogenesis of learning and memory during zebrafish development.

Discussion: The transparency and small size of the larva combined with its vertebrate brain organization, is an exceptional model. The barin areas equivalent to the amygdala and hippocampus are much more exposed to manipulation and imaging than in mammals and its amenability to genetic screening and manipulation tools provide a unique experimental system to explore the psychophysiology of learning and memory in future studies.

Publications: Valente A, Huang KH, Portugues R, Engert F. 2012. Ontogeny of classical and operant learning behaviors in zebrafish. Learning and Memory. *In press.* Cold Spring Harbor Laboratories Press.

Keywords: Learning, Memory, Zebrafish, Development, Conditioning.

2006

01/06 - "Automated testing for telepathy using emails and telephone calls" – only abstract available
Instituição/*Institution*: Perrot-Warrick Project, London - UK
Duração/D*uration*: 2007/10 - 2010/06
Investigadores/*Researchers*: Prof. Rupert Sheldrake, Ms. Pamela Smart, Dr. David Luke

Objectives: The purpose of this project was to develop automated tests using emails, SMS messages and telephone calls to find out if subjects could guess at levels above chance who, out of three people, was contacting them.

Methods: Subjects registered online giving the names and email addresses or mobile phone numbers of three contacts. In each trial the computer picked one of the three contacts at random and sent her an email or text message asking her to contact the subject through the computer system. The subject was then informed by email, SMS message or phone call that one of the contacts was getting in touch with him, and he had to guess which of the three it was. After guessing he received the message or phone call, and thus received immediate feedback. All details of the trials were automatically recorded and stored in an online database.

Results: In the automated email telepathy tests, in a total of 419 trials there were 175 hits (41.8%), significantly above the chance level of 33.3% ($p = 0.0001$). There was no significant difference in hit rates with male and female subjects. The highest hit rates were with subjects in the 20-29 age group. In the automated SMS test, in 886 trials there were 336 hits (37.9%), significantly above the chance level ($p = 0.001$). High-scoring subjects were re-tested in filmed trials, with a hit rate of 44.2%. In the automated telephone telepathy test, in 1917 trials there were 827 hits (43.0%). This figure was very significantly above chance ($p < 1x10^{-9}$). Again there was no significant difference between male and female subjects. The automated SMS and telephone test were also carried out in a precognitive form, in which subjects had to guess who was about to text or call them before the text or call was made. The random selection of contacts occurred only after they had made their guess. With SMS messages the hit rate was 110 out of 339 trials, 32.4%; and with telephone calls 240 out of 722, 33.2%, not significantly different from the chance level of 33.3%.

Discussion: The contrast between the positive results in telepathy tests and non-significant results in the precognition tests shows that the positive effects cannot be explained in terms of precognition. These automated tests provide a simple, replicable way in which telepathy can be tested in real-life conditions. A new automated version of the telephone telepathy test with two contacts rather than three is now available online on my web site www.sheldrake.org

Publications:
R. Sheldrake and L. Avraamides (2009) An automated test for telepathy in connection with emails. Journal of Scientific Exploration 23, 29-36.
R. Sheldrake, L. Avraamides and M. Novák (2009) Sensing the sending of SMS messages: an automated test. Explore: The Journal of Science and Healing 5, 272-276

Keywords: telepathy, automated tests, precognition, SMS messages, emails, mobile telephones.

44/06 - "Brain Electric Activity in Meditation: Extension of Earlier Work and Hypothesis Testing"
Instituição/*Institution*: The KEY Institute for Brain-Mind Research, University Hospital of Psychiatry, Zurich - Switzerland
Duração/*Duration*: 2007/10 - 2011/01
Investigadores/*Researchers*: Prof. Dietrich Lehmann, Mr. Shisei Tei, Dr. Pascal Faber, Prof. Hiraoki Kumano, Dr. Lorena Gianotti, Dr. Roberto Pascual-Marqui

Objectives: Meditation reportedly leads to increased functional connectivity. Previous studies on specific meditation traditions computed coherence between head-surface EEG time series. This suffers from (a) reference-dependence, (b) ambiguous source localization, and (c) overestimation due to volume conduction [1]. EEG lagged intracerebral coherence between source-model time series solves these caveats [1]. With this method we studied functional connectivity during meditation in 5 groups of experienced meditators (13 Tibetan Buddhists, 15 QiGong, 14 Sahaja Yoga, 14 Ananda Marga Yoga, 15 Zen).

Methods: 19-channel EEG during pre-rest, meditation and post-rest was recomputed (8 EEG frequency bands) into (a) conventional EEG coherence between 19 head-surface time-series and (b) intracerebral lagged coherence between 19 cortical regions of interest with sLORETA. The possible 171 (19*18/2) head-surface and intracerebral lagged coherences were statistically compared between conditions corrected for multiple testing. Topography of intracerebral lagged coherence (computing PCA-based principal connectivities) was compared going in and coming out of meditation.

Results: Meditation versus pre- and post-rest revealed only lowered intracerebral lagged coherence in all 5 groups and all 8 EEG frequency bands. Head-surface coherence also was prominently lowered. In delta and beta-2 bands, different connectivity topographies occurred going in and coming out of meditation [2].

Conclusions / Discussion: Contrary to reportedly increased functional connectivity in meditation, our results showed a global lowering of functional connectivity during meditation compared to pre- and post-rest, concerning all 8 EEG frequency bands and all 5 meditation traditions. This may reflect decreased interactions between the sub-processes of the self function and reduced constraints on the self function by other processes, leading to subjective experiences during meditation such as non-involvement and letting go, as well as of all-oneness and dissolution of ego borders.

Publications:
[1] Pascual-Marqui RD (2007), *arXiv:0711.1455*.
[2] Lehmann D, Faber PL, Tei S, Pascual-Marqui RD, Milz P, Kochi K (in press), Neuroimage, in press.

Keywords: LORETA, meditation, lagged intracortical coherence, EEG, functional connectivity

64/06 - "Brain Imaging Study of the Psychological Antecedents and Neural Correlates of Moral Judgement"

Instituição/*Institution*: Ian Ramsey Centre, University of Oxford - UK
Duração/*Duration*: 2007/02 - 2008/12
Investigadores/*Researchers*: Dr. Nicholas Shackel, Dr. Katja Wiech, Dr. Guy Kahane, Dr. Miguel Farias

Aims: Previous neuroimaging studies of moral dilemmas have suggested that different modes of moral deliberation have distinct neurobiological correlates: deontological, rule-based judgments have been associated with automatic, affect-laden moral intuitions; and utilitarian, utility-maximizing judgments with controlled cognitive processing. However, the respective contribution of content (deontological or utilitarian) and intuitiveness to moral judgement is still unclear, and the neural bases of moral intuitions remain obscure.

Methods: Using functional magnetic resonance imaging (fMRI) in healthy volunteers, we investigated the neural bases of counterintuitive moral judgements, while controlling for the content of these judgments (utilitarian versus non-utilitarian). More specifically, we investigated the relationship between the effort required to arrive at a moral judgement, as reflected by behavioural and neural responses during moral decision-making, and two personality traits, each potentially reflecting one of the two postulated pathways to counterintuitive moral judgment (cognitive effort or emotional deficit).

Results: Counterintuitive judgements were perceived as more difficult than intuitive judgements, whereas there was no significant difference in perceived difficulty between utilitarian and deontological judgments. Further, we show that the difficulty of making counterintuitive moral judgments is reflected in activation in the rostral anterior cingulate cortex (rACC). Importantly, rACC activation during counterintuitive judgments of a specifically utilitarian character was negatively correlated with 'psychoticism', a trait associated with diminished affect and social awareness, but not with 'need for cognition', a trait reflecting preference for complex cognition.

Conclusions: At the neural level, the fMRI data suggest that previously reported differences in moral judgment are in fact largely due to their intuitiveness and not to their content.

Discussion: Our data thus suggest that recent attempts to draw support for utilitarian ethics on the basis of research on the neuroscience of moral cognition are premature. More importantly, our findings provide evidence that counterintuitive moral judgment in healthy individuals can be based in two distinct neural mechanisms, and that the rACC is a key structure in moral cognition which can serve as a biomarker for these
two pathways to moral judgment.

Published Results:

Kahane, G., Wiech, K., Shackel, N., Farias, M., Savolescu, J., & Tracey, I. (2011). The neural basis of intuitive and counterintuitive moral judgment. *Social Cognitive and Affective Neurosciences*. doi:10.1093/scan/nsr005

Keywords: Neuroimaging, moral judgment, decision-making, cognition, emotion

73/06 - "The role of the cortico-basal ganglia circuit in learning and memory: From patient studies to functional neuroimaging"
Instituição/*Institution*: IBILI - Faculdade de Medicina, Universidade de Coimbra - Portugal
Duração/*Duration*: 2008/01 - 2011/09
Investigadores/*Researchers*: Dr. Marieke van Asselen, Prof. Albert Postma, Prof. Doutor António Freire Gonçalves, Dr. Inês Almeida, Dr. José Rebola

Objectives: Investigate the mechanism underlying implicit contextual learning and study its neural correlates.

Methods: A series of contextual cueing tasks were developed to study different aspects of implicit contextual learning using eye movement recording. Moreover, to define the neural correlates of implicit contextual cueing, several patient and neuroimaging studies were performed.

Results: We have shown that a snapshot of local contextual information is made using peripheral vision and that different types of contextual information can be used to facilitate visual search through a specific underlying mechanisms. Furthermore, we have demonstrated the importance of the basal ganglia in implicit learning. Finally, distinct neural correlates were found when different types of contextual information were used.

Conclusions: Implicit contextual cueing is a complex learning mechanism in which different types of contextual information can be used to facilitate visual search through distinct attention mechanisms. Furthermore, neural correlates of implicit contextual cueing include the basal ganglia, MTL and fronto-parietal networks.

Discussion: Future research projects should be aimed at further defining the specific role of the basal ganglia and MTL.

Publications:
Van Asselen, M., Almeida, I., André, R., Januário, C., Freire Gonçalves, A., Castelo-Branco, M. (2009). The role of the basal ganglia in implicit contextual learning: A study of Parkinson's disease. *Neuropsychologia*, 1269-1273.
Van Asselen, M., Castelo-Branco M (2009). Long-term implicit memory for peripherally perceived contextual information. *Perception & Psychophysics,* 71(1), 76-81.
Van Asselen, M., Sampaio, J., Pina, A., Castelo- Branco, M., (2010). Object based implicit contextual learning: A study of eye movements. *Attention, Perception & Psychophysics*.
Van Asselen, M., Almeida, I., Júlio, F., Januário, C., Bobrowicz Campos, E., Simões, M., Castelo-Branco, M. (major revision). Implicit contextual learning in presymptomatic and early stage Huntington's disease patients. *Neuropsychology.*

Keywords: implicit contextual learning, neural correlates, eye movements.

93/06 - "Exploring the relationship between susceptibility to false memories and belief in and experience of the paranormal"

Instituição/*Institution*: Anomalistic Psychology Research Unit, Dep. of Psychology, Goldsmiths College, University of London - UK

Duração prevista/*Estimated duration*: 2010/02 - 2012/03

Investigadores/*Researchers*: Prof. Christopher Charles French, Dr. Krissy Wilson

Objectives: Although there are sound reasons to predict a positive correlation between susceptibility to false memories and level of paranormal belief, it is also the case that any tendency on the part of respondents to respond consistently in a positive or negative manner regardless of the question would also produce such a pattern of results. Two experiments are reported investigating the latter possibility.

Methods: Experiment 1 involved asking 119 respondents to complete a "News Coverage Questionnaire" (NCQ) asking for details of memories of footage for various dramatic news events. However, one of the items in the current version was entirely fictitious. Respondents also completed the Australian Sheep-Goat Scale (ASGS) to measure paranormal belief and the Creative Experiences Questionnaire (CEQ) to measure fantasy proneness. Experiment 2 involved asking 77 respondents to complete a version of the NCQ in which all items were real news items but one had not been caught on camera. Respondents also completed the ASGS, the Anomalous Experiences Inventory (AEI), and the Acquiescence Bias Scale (ABS).

Results: In Experiment 1, none of the respondents claimed to remember the fictitious news event. A significant correlation was found between paranormal belief and fantasy proneness. In Experiment 2, 35% of participants reported having seen non-existent footage. These respondents scored significantly higher than others on the ASGS and the Experience sub-scale of the AEI. Scores on the ABS did not correlate with those on the ASGS, the AEI, nor with the tendency to report having seen the non-existent footage.

Discussion: The fact that no respondent reported a memory for the fictitious event suggests that respondents reporting memories for non-existent footage in other studies were not doing so simply as a result of acquiescence bias. Experiment 2 replicated previous research showing a correlation between susceptibility to false memories and paranormal belief but also that this was not due to acquiescence bias.

Conclusion: The correlation between susceptibility to false memories and paranormal belief appears not to be due to acquiescence bias.

Publications: None to date.

Keywords: Paranormal belief; false memories; acquiescence

94/06 - "Feedback Modulation of Visual Processing by Limbic Circuits: a functional connectivity approach to visual face processing"

Instituição/*Institution*: IBILI - Faculdade de Medicina, Coimbra - Portugal
Duração/*Duration*: 2008/01 - 2011/02
Investigadores/*Researchers*: Prof. Doutor Miguel de Sá e Sousa de Castelo-Branco, Dr. Cristina Januário, Dr. Solange Silva, Dr. Aldina Reis, Dr. Catarina Mateus, Dr. Miguel Cordeiro

Objectives: We have examined the specificity of face recognition networks in relation to other object recognition modules in normal subjects. In particular, we addressed a current challenge in cognitive neuroscience by using a novel paradigm that allowed for an explicit separation of the neural correlates of the sensory, perceptual and motor components in holistic perceptual decision. This strategy, which was anchored on a well defined neurochronometry of cognitive processes helped elucidate the contribution of different regions in the visual stream and insular networks in perceptual decision making. The emergence of holistic percepts occurred in the absence of change in local saliency cues. This allowed for assessing mechanisms of global perceptual awareness irrespective of changes in local sensory evidence.

Methods: We used Event Related Potential and fMRI measures and techniques to study response invariance properties of object processing networks, in particular 3D abstract objects and faces were also tested. We have also studied oculomotor responses to emotional faces in normal subjects and Huntington disease (carriers, relative or already with the disease), using calibrated stimuli modified from the FEEST database. Perceptual correlates of holistic object processing in normal subjects and neurodevelopmental conditions were also studied using “Mooney” and hierarchical stimuli. Finally, to separate automatic from conscious aspects of emotional processing of faces, we used a skin conductance (SCR) measurement approach, in relation of online rating of arousal and valence of facial emotions (calibrated in comparison with pictures taken from the International Affective Picture Scale).

Results: Besides sensory, decision, accumulator and motor processing areas, our study identified hybrid areas in the high-level visual cortex that exhibit traits of both sensory processors and accumulators. We have also found Gamma band neural activity is related to perceptual “Eureka” effects when observing ambiguous dynamic faces/objects. Our data also how a parametric modulation of object-related ERP components by depth range and hence indicate a clear interaction between the depth of 3D object perception and object-related ERP signals across dorsal and ventral streams. Concerning afective processing we have found that duration explains modulations of SCRs better than awareness levels. This suggests that the SCR is not a specific measure for threat detection under unaware conditions but that it is dependent on conscious processing and higher cognitive functions. Finally, our work suggests further links of the episodic memory system to the default network and a differential
recruitment of striatal circuits and dependence of hippocampal deactivation on the type of attentional load.

Conclusions: We have established a clear and simultaneous separation between sensory, perceptual and motor components in perceptual decision and affective processing .

Publications:

Graewe B, de Weerd P, Farivar R, Castelo-Branco M. Stimulus Dependency of Object-evoked Responses in Human Visual Cortex: An Inverse Problem for Category Specificity PLoS ONE 2012 7(2): e30727.

Van Asselen M, Júlio F, Januário C, Campos EB, Almeida I, Cavaco S, Castelo-Branco M. Scanning Patterns of Faces do not Explain Impaired Emotion Recognition in Huntington Disease: Evidence for a High Level Mechanism. Front Psychol. 2012;3:31. Epub 2012 Feb 16.
Lemos R, Figueiredo P, Santana I, Simões M, Castelo-Branco M. Temporal Integration of 3D Coherent Motion Cues Defining Visual Objects of Unknown Orientation is Impaired in Amnestic Mild Cognitive Impairment and Alzheimer's Disease, J Alzheimers Dis, 28: 4, 2012 Jan 1;28(4):885-96 2011 Nov 21. [Epub ahead of print].

Keywords: object processing, face recognition, perceptual decision, emotion, limbic system

131/06 - "How do we learn to associate events separate in time: a study using trace auditory fear conditioning"
Instituição/*Institution*: Instituto Gulbenkian de Ciência, Oeiras - Portugal
Duração/*Duration*: 2007/01 - 2010/07
Investigadores/*Researchers*: Dr. Marta de Aragão Pacheco Moita, Dr. Marta Guimarães

Objectives: Ultimately associative learning is a function of the temporal features and relationships between experienced stimuli. Nevertheless how time affects the neural circuit underlying this form of learning remains largely unknown. To address this issue, we used single-trial auditory trace fear conditioning and varied the length of the interval between tone and foot-shock. Through temporary inactivation of the amygdala, medial-prefrontal cortex (mPFC) and dorsal-hippocampus in rats, we tested the hypothesis that different temporal intervals between the tone and the shock influence the neuronal structures necessary for learning.

Methods: Rats were implanted with bilateral cannulae targeting dorsal hippocampus, lateral amygdala or mPFC, under stereotaxic surgery. Muscimol, a GABAa agonist that efficiently shuts down activity, was infused into the targeted region just prior to the trace fear conditioning session. Rats in teh control group received infusions of the vehicle solution. The next day all rats were tested for their fear of the tone in a distinct environment. Freezing was used as a measure of fear.

Results: We show for the first time that the amygdala is critically involved in the acquisition of auditory fear learning when there is a temporal gap between the tone and the shock. Moreover, imposing a short interval (5 s) between the two stimuli also recruits the medial pre-frontal cortex (mPFC), while learning the association across a longer interval (40 s) becomes additionally dependent on a third structure, the dorsal-hippocampus.

Conclusion: Thus, our results show that increasing the interval length between tone and shock leads to the requirement of an increasing number of brain areas for the association between the two stimuli to be acquired.

Publication: Guimarãis M, Gregório A, Cruz A, Guyon N, Moita MA.Time determines the neural circuit underlying associative fear learning. Front Behav Neurosci. 2011;5:89. Epub 2011 Dec 27.

Keywords: Amygdala, mPFC, hippocampus, trace fear conditioning, muscimol, single-trial

144/06 - "Event-related brain potential correlates of conscious and non-conscious processing in anxiety"

Instituição/*Institution*: Birkbeck College, University of London and Roehampton University, London -UK

Duração/*Duration*: 2007/10 - 2010/11

Investigadores/*Researchers*: Dr. Anne Richards e Dr. Amanda Holmes, Dr. Emily Hannon

Objectives: An adaptation paradigm was used to examine the effect of context on emotional expression processing in anxiety. We predicted that fear/neutral morphs would be more likely to be classified as 'fearful' following neutral adaptation and 'neutral' following fearful adaptation. We examined several ERP components (P1, EPN and the LPP) in order to investigate the time course of differential processes involved in ambiguity resolution and whether these effects are modulated by anxiety.

Methods: A male and a female model were selected and fear/neutral morphs created. Participants classified test trials following adaptation to the fear or neutral exemplar. 16 test blocks were presented, and participants classified the emotional expression of each test trial. EEG was recorded using a NeuroScan NuAmmps system, and stimulus presentation was controlled using E-Prime. The high temporal resolution of the EEG technique enabled us to examine the locus of the expression aftereffects in anxiety. Several ERP components were examined to see if they were modulated by anxiety.

Results: There was a shift in the behavioural classification of morphs towards 'fear' following adaptation to the neutral exemplar compared to adaptation to the fear exemplar, and this shift was equivalent for high and low anxiety. The behavioural analysis revealed that the female face was classified as being fearful more often at baseline and following neutral adaptation compared to the male face. An analysis of the ERP data, however, revealed a more pronounced late positive potential, beginning at ~400 ms post-stimulus onset, in the high but not the low anxiety group following adaptation to neutral compared to fear.

Conclusions: These data support the proposal that high anxiety is associated with increased sensitivity to contextual influences from top-down elaborative modulations, as reflected in an enhanced late positive potential deflection. These data offer support for an increase in sensitivity to context in high anxiety.

Discussion: The adaptation paradigm combined with behavioural report and EEG is a useful technique for examining the effect of context on categorization of ambiguous information. These data reveal a late effect of context on categorization in anxiety.

Publications:

Richards, A., Holmes, A., Pell, P. J., & Bethell, E. J. (submitted). Adapting effects of emotional expression in anxiety: evidence for an enhanced Late Positive Potential.

Keywords: ERPs, Anxiety, Adaptation, Emotional Expressions.

151/06 - "The Measurement and Characterization of Charge Accumulation and Electromagnetic Energy Emissions from Bioenergy Healers: Part 2"
Instituição/*Institution*: Rhine Research Centre, Durham, North Carolina - USA
Duração/*Duration*: 2007/02 - 2012/03
Investigador/Researcher: Prof. William Joines

Objectives: Our Bio-fields Laboratory at the Rhine Research Center detects electromagnetic radiation from humans during times of focused intent (usually healing meditations). Everyone emits infrared electromagnetic radiation that is just beyond the visible range, and we sense this radiation as heat or warmth. We also emit invisible ultraviolet radiation. We hope to discover how ultraviolet photon emissions are generated by human subjects and how it is being used by our sensory system, or by our minds, to influence healing to interact with materials.

Methods: Participants are placed in a dark room with an infrared detector that is more sensitive than the human sensory system and a photomultiplier detector designed to detect UV radiation that is invisible to the human eye. The photomultiplier detector exceeds the sensitivity of the human eye by detecting wavelengths from approximately 450 nanometers to 250 nanometers. (Visible spectrum = 700 to 400 nanometers). This detector is used to measure electromagnetic radiation from humans at the higher-frequency (shorter wavelength) ultraviolet end of the visible spectrum.

Results: Using the infrared detectors, we have noted that most healers become much redder on the forehead and palms as the healing meditation progresses. Over a multi-year period we have measured radiation from approximately 100 different subjects in the darkroom using the photomultiplier detector which measures the number of photons per second that are emitted. With the darkroom is empty, the photomultiplier detector reads a baseline count of approximately 5 photons per second. The count rises to approximately 8 or 10 photons per second with human control subjects in the darkroom. In a recent series of tests with groups of three subjects in the darkroom doing healing meditations, the photon count typically rose to approximately 40 to 60 photons per second. When the subjects were instructed to stop meditating, the count consistently dropped back to the baseline of approximately 8 to 10 photons per second. Three individual subjects on multiple occasions have emitted 400,000 to 800,000 photons per second over a time span of several seconds.

Conclusions: Since photons are energy, and since healers and meditators are emitting measureable increases in photons, these individuals are emitting invisible energy. This energy may be associated with healing or with other events generated through meditation.

Key Words: focused intent, darkroom, ultraviolet radiation

169/06 - "Exploring the relationship between paranormal belief, the propensity to make the type I error and the detection of paranormal and weak signals amid visual and auditory noise" – only abstract available
Instituição/*Institution*: Liverpool Hope University - UK
Duração/D*uration*: 2009/09 - 2011/01
Investigador/*Researcher*: Dr. Christine Anne Simmonds-Moore

Objectives: To explore the perceptual biases (Type I and Type II errors) associated with paranormal belief and disbelief.

Methods: Ninety five self-defined believers and skeptics completed a questionnaire battery consisting of the Australian Sheep-Goat Scale, the Parapsychological experiences subscale of The Assessment Schedule for Altered States of Consciousness, the short version of the Oxford-Liverpool Inventory for Feelings and Experiences and the Magical Ideation Scale. Each took part in a computerized experiment consisting of one visual and one auditory block of trials, each consisting of a psi trial, two weak stimuli trials and one random trial (8 trials each). For each trial, participants were asked to make general notes and sketches on general impressions, thoughts and feelings and press a button on the computer if and when they could identify something amid visual or auditory noise.

Results: More guesses were made for the visual condition. Believers and skeptics did not differ in the number of guesses made. There were differences in the qualitative nature of guesses, the speed at which guesses were made (for the auditory condition), confidence about guesses and the number of misidentifications made. Believers and skeptics did not differ in their ability to overtly detect weak visual or auditory stimuli or in ESP performance. There were trends toward, but no significant ESP effects. Schizotypy (OLIFE) scoring indicated that there is a healthy and less healthy type of believer and a healthy and less healthy type of skeptic. There were no differences between the two types of believer on ESP scoring. The Magical Ideation scale did not correlate with ESP.

Conclusions: There is some evidence that believing in the paranormal is associated with making the type I error. However, skeptics also perceive stimuli where none are present, particularly for the visual sense.

Discussion: Given that skeptics and believers do not differ in their detection of weak stimuli (or detection of a psi stimulus), the notion that perceptual biases are 'errors' could be challenged.
Publications: Simmonds-Moore, C.A. (2010). Exploring how schizotypy and paranormal belief influence the tendency to make the type I error and the detection of degraded and paranormal stimuli in random noise. Research Brief presented at the 53rd Annual convention of the Parapsychological Association.

Keywords: Paranormal belief and disbelief, schizotypy, perceptual biases, ESP.
*NB this work was carried out whilst Dr. Simmonds-Moore was based at Liverpool Hope University.

2008

15/08 - "Psi information system software design for parapsychological research: SIPSI v.3.0: references, bibliometry research and video-DVD collection database"
Instituição/*Institution*: Instituto de Psicologia Paranormal, Buenos Aires - Argentina
Duração/*Duration*: 2009/02 - 2011/01
Investigadores/*Researchers*: Dr. Alejandro Enrique Parra, Sr. Alejandro Jarandilla, D. Teresa Porcel, Sr. Bernardo Olivares Torres, Sr. Jorge Villanueva

Objectives: The aim of the SIPSI v.3.0 was to include a bibliographic citation and/or an abstract, of any book or article (scholarly or popular), thesis, chapter, conference proceedings paper, or separate report or monograph on parapsychology or related consciousness studies.

Method: SIPSI v.3.0 is a collection of computerized bibliographic databases that em-phasize parapsychology and related consciousness disciplines. The latter includes literature on altered states, spiritual disciplines that may be psi related, the mind-body relationship, consciousness anomalies, and theories, methods, and techniques dealing with aspects of consciousness.

Results & Conclusions: Where obtainable, citations to non-English language materials were also included, if possible with English and non-English abstracts. Non-English languages included are Dutch, French, German, Italian, Japanese, Polish, Portuguese, Russian, and Spanish. Also included are relevant articles published in subject speciality journals in such fields as psychology, physics, engineering, education, philosophy, religion, psychiatry, medicine, literature, folklore, mathematics, anthropology; general science magazines. We also to include books and articles on parapsychology from 1900 to date and some of the most relevant books from other disciplines up to 2010.

Publications: No submitted until now.

Keywords: Non-English language materials, computerized bibliographic databases, parapsychology, consciousness studies

17/08 - "Enhancing psychokinesis task performance: volition another attempt to study PK performance through the practice of imagery strategies"
Instituição/*Institution*: Instituto de Psicologia Paranormal, Buenos Aires - Argentina
Duração/*Duration*: 2009/02 - 2011/02
Investigadores/*Researchers*: Dr. Alejandro Enrique Parra, Dr. Juan Manuel Corbetta, Dr. Irma Juana Caputo

Objectives: Two studies were done exploring the effectiveness of two PK imagery strategies derived from a survey of popular writings on how to develop psychic skills. Goal-oriented imagery involves visualizing only the final outcome or desired goal; process-oriented imagery involves visualizing some sort of process gradually leading up to the desired final outcome.

Method: In the first study, 62 subjects were asked to bias the behavior of a visual display controlled by a random number generator, using each imagery strategy half the time (8 runs of 16 trials for each strategy). In the second study, we investigate the effects of two psychologically distinct techniques of attempting to influence falling dice. In the first technique ("conscious concentration"), the subject was requested to attempt, by consciously focusing his willpower and inducing a tension in his muscles, to force the dice to fall with the target face upward. In the second technique ("visualization"), the subject was asked merely to visualize the desired face while in a state of relaxation.

Results: There was significantly positive overall evidence for PK ($p < .02$) and for PK during goal-oriented imagery ($p < .01$). If one considers the subject as the unit of analysis, subjects' overall scores differed significantly from chance ($p < .05$); neither imagery strategy produced scores that differed significantly from chance, and goal-oriented scores did riot differ significantly from process-oriented scores. In a second study, 20 subjects attempted the same PK task, using each imagery strategy half the time. An analysis of variance revealed that goal-oriented imagery scores were significantly greater than process-oriented scores, that prior training was not itself a significant factor, but that imagery strategy and prior training interacted significantly ($p < .02$).

Conclusion: Before considering possible interpretations of the results, some alternative hypotheses for the observed PK effects should be considered. It is possible, for instance, to advance the hypothesis that the effects were due solely to chance, excluding a parapsychological influence. The negative deviation obtained in Condition 1 and the differential scoring between the conditions indicate that the various effects are unlikely to be due to chance alone.

Publications: No submittted until now.

Keywords: Imagery – Goal-oriented – PK scoring – RNG – Zener diode

29/08 - "Emotional processing from language and music: Comparative neurocognitive and functional neuroimaging studies"

Instituição/*Institution*: Centro de Psicologia da Universidade do Porto, Grupo de Investigação em Linguagem - Portugal

Duração prevista/*Estimated duration*: 2009/01 - 2012/03

Investigadores/*Researchers*: Prof. Maria de São Luís de Vasconcelos Fonseca e Castro Schöner, Dr. Armando César Ferreira Lima, Prof. António José de Bastos Leite, Prof. Maria Carolina Lobo Almeida Garrett

Objectives: One of the design features of humans is that we can perceive emotions in spoken language and in music. Here we investigate the neurocognitive mechanisms through which primary emotions such as happiness or fear are recognized in speech prosody and in short musical excerpts, with an emphasis on the question of what is common across domains and what differs.

Methods and Results: In Study [1], we developed and validated a database of spoken sentences and pseudo-sentences designed to express by prosody alone anger, disgust, fear, happiness, sadness, surprise and neutrality . In Study [2], we tested younger and older adults in the recognition of two positive and two negative emotions in music; accuracy for happiness and peacefulness remained stable, but accuracy for fear and sadness decreased from middle-age onwards; a serendipitous finding was that music training modulated recognition accuracy. In Study [3], we compared Parkinson's disease patients with age matched controls in the recognition of the same or equivalent emotions in speech prosody (using materials developed in Study 1) and in music (with materials selected on the basis of Study 2), and found a dissociation between domains: patients were impaired for positive emotions in music but not in speech, and for sadness in speech but not in music. The impairment for music was not associated with perceptual or cognitive dysfunctions, but the impairment for speech correlated with executive dysfunction. This is evidence that emotion processing in speech prosody and music is probably sustained by partially segregated mechanisms. The role of musical training on emotion recognition was followed up in two further studies where musicians and musically naive listeners were compared. In study [4], we found a cross-domain transfer: musicians recognized emotions in speech more accurately than musically naive listeners. In study [5], we found that musical training was positively correlated with the recognition of emotions in music.

Conclusions and discussion: Taken together, these findings support the view that neurocognitive mechanisms subtending the recognition of emotional expressions are partly shared, and partly segregated, in speech and in music.

Publications:

[1] SL Castro, C Lima, Behav Res Meth 42, 74-81 (2010).
[2] C Lima, SL Castro, Cognition Emotion 25, 585-598 (2011).
[3] C Lima, C Garrett, SL Castro, Emotion processing in music and speech prosody in Parkinson's disease (under review).
[4] C Lima, SL Castro, Emotion 11, 1021-1031 (2011).
[5] SL Castro, C Lima, Changing emotions: Age and musical expertise modulate emotion recognition in music (submitted).

Keywords: Emotion recognition; speech prosody; music; aging; Parkinson's Disease

30/08 - "Does meditation practice modulate the dynamics of attentional neural networks? An EEG study"

Instituição/*Institution*: Liverpool John Moores University, School of Psychology - UK
Duração/*Duration*: 2009/09 - 2011/04
Investigadores/*Researchers*: Dr. Peter Malinowski, Prof. Thomas Gruber, Dr. Gernot G. Supp

Objectives: Mindfulness based meditation practices involve various attentional skills, including the ability to sustain and focus one's attention. During a simple mindful breathing practice, sustained attention is required to maintain focus on the breath while cognitive control is required to detect mind wandering. As the refinement of attentional functions is considered to significantly contribute to the positive effects of meditation practice, the aim of this project was to investigate whether brief regular mindfulness meditation practice would result in improvements in the self regulation of attention and foster changes in neuronal activity related to attentional control.

Methods: A longitudinal randomised control group EEG study was conducted. At baseline (T1), 40 meditation naïve participants were randomised into a wait list group and a meditation group, who received three hours mindfulness meditation training. 28 participants remained in the final analysis. At T1, after 8 weeks (T2) and after 16 weeks (T3), all participants performed a computerized Stroop task (a measure of attentional control) while the 64-channel EEG was recorded. Between T1 and T3 the meditators were requested to meditate daily for ten minutes.

Results: Event-related potential (ERP) analysis highlighted two between group effects that developed over the course of the 16-week mindfulness training. An early effect at left and right posterior sites 160 – 240 ms post stimulus indicates that meditation practice improved the focusing of attentional resources. A second effect at central posterior sites 310 – 380 ms post stimulus reflects that meditation practice reduced the recruitment of resources during object recognition processes, especially for incongruent stimuli. Scalp topographies and source analyses (VARETA) indicate relevant changes in neural sources, pertaining to left medial and lateral occipitotemporal areas for the early effect and right lateral occipitotemporal and inferior temporal areas for the later effect.

Discussion and Conclusions: The results suggest that mindfulness meditation may alter the efficiency of allocating cognitive resources, leading to improved self regulation of attention. That meditating for only 10 minutes per day leads to significant changes in neural activity highlights the potential mindfulness practice may have for the everyday user.

Publications:

Chiesa, A. & Malinowski, P. (2011). Mindfulness based approaches: are they all the same? *Journal* of Clinical Psychology, 67(4), 1-21. [doi: 10.1002/jclp.20776]
Malinowski, P., Mead, B. and Pozuelos-López J. (2011). Individual levels of mindfulness predict brain activity related to inhibitory control and response monitoring. *Front. Hum. Neurosci. Conference Abstract: XI International Conference on Cognitive Neuroscience (ICON XI)*. [doi: 10.3389/conf.fnhum.2011.207.00050]
Pozuelos-López, J., Mead, B., Rueda, M. and Malinowski, P. (2011). Mindfulness and cognitive control: are they really related? *Front. Hum. Neurosci. Conference Abstract: XI International Conference on Cognitive Neuroscience (ICON XI).* [doi: 10.3389/conf.fnhum.2011.207.00260]

Keywords: Meditation, mindfulness, cognitive control, electrophysiology, attention

32/08 - "Conscious will and voluntary actions: is there a last ventriloquist in the brain?"
Instituição/*Institution*: Hospital for Sick Children, University of Toronto - Canada
Duração/*Duration*: 2009/04 - 2012/02
Investigadores/*Researchers*: Prof. Jose Luis Perez Velazquez, Dr. Richard Wennberg, Dr. Luis Garcia Dominguez

Objectives: A fundamental topic in neuroscience is the nature of "free will" and how it is derived from neurophysiological processes. In this study, we investigate decision-making by examining the differences in brain activity underlying free and forced behaviours using magnetoencephalographic (MEG) recordings from subjects performing button pressing tasks that require them to exercise their choice by pushing one of two buttons in response to various cuing methods.

Methods: MEG recordings were taken from participants who either act on a choice by pushing one of two buttons when cued to do so, or pushing one particular button in response to a specific instruction. The instructions for the types of button press were supplied using visual or verbal cues that were provided in real time, or using pre-specified cues that instructed the subject to press buttons in the order of a memorized sequence or to freely press buttons for a period of time. Analysis of the directionality of coupling between brain areas (but we work at the sensor level) was assessed using Granger causality.

Results & Discussion: The greatest ability to discriminate (>80% classification accuracy) *free* and *forced* trials came from MEG sensors located over the primary sensory cortices specific for the modality used to cue each trial: either visual (occipital) or auditory (left temporal), and minor non-localized differences for trials that were pre-specified.

Conclusions: These findings suggest that primary sensory areas play a crucial part of the information processing steps organizing the production of free and forced behaviours, and that, contrary to the current conceptualisation, fronto-parietal processes may not be the principal determinants of these actions.

Publications:
Dominguez LG, Kostelecki W, Wennberg R, Pérez Velázquez JL. Distinct dynamical patterns that distinguish willed and forced actions. *Cogn Neurodyn* 5(1): 67-76, 2011.
Kostelecki W, Dominguez LG, Pérez Velázquez JL. Single trial classification of magnetoencephalographic recordings using Granger causality. *J Neurosci Meth* 199(2): 183-191, 2011.

Keywords: Choice-making; free will; magnetoencephalography; single trial classification

34/08 - "Process- and Proof-focused Investigation of Anomalous Information Reception by Mediums: A Two-Part Quantitative Study"
Instituição/*Institution*: The Windbridge Institute for Applied Research in Human Potential, Tucson - USA
Duração/*Duration*: 2009/01 - 2011/02
Investigadores/*Researchers*: Dr. Julie Beischel, Dr. Adam J. Rock, Dr. Mark E. Boccuzzi, Mr. Michael Biuso

For Grant 34/08, Part II of the study addressed the following hypothesis: Windbridge Certified Research Mediums (WCRMs) can report accurate and specific information about the deceased loved ones (termed discarnates) of living people (termed sitters) using anomalous information reception (AIR); that is, without any prior knowledge about the discarnates or sitters, in the absence of any sensory feedback, and without using deceptive means.

Objectives: The research question this study addressed was: Is there a difference between accuracy scores given to readings by the sitters for whom the readings were intended and the scores given to those readings by sitters for whom the readings were not intended?

Methods: Each of eight WCRMs performed two quintuple-blind readings for two absent sitters. The associated sitters then scored each of the readings for accuracy without knowing which was which.

Results: Twelve of the eight WCRMs' 16 readings were returned by the sitter-raters for analysis. Eleven of 12 sitters chose the intended vs. control reading as their own when asked to make a choice ($p = 0.003$; one-tailed). The mean Global and Percent Accuracy scores given by sitters for whom readings were intended were significantly higher than those scores given by sitters for whom the readings were not intended (3.4 and 54% vs. 2.0 and 33%, respectively; $F(2, 21) = 4.52$, $p = 0.02$). In addition, the effect sizes determined for whole-reading and item-by-item scores were both large (Cohen's $d = 1.07$ and 1.20, respectively). Finally, the statistic prep (the probability of replicating the direction of the effect) was found to be high for both types of accuracy scores (0.84 and 0.87, respectively).

Conclusions: These data demonstrate that WCRMs can report accurate and specific information about discarnates using AIR.

Discussion: The results from this study begin to address the question at the root of mediumship research: Does consciousness survive physical death?

Publications: Data from this study were presented at the 30th Annual Meeting of the Society for Scientific Exploration and at Parapsychology and Consciousness: the First Annual Atlantic University Conference.

Keywords: mediums, anomalous information reception, survival of consciousness

36/08 - "Neural Correlates of Sympathetic Magical Belief" – only abstract available
Instituição/*Institution*: Cardiff University Brain & Repair Imaging Centre - UK
Duração/*Duration*: 2009/02 - 2012/01
Investigadores/*Researchers*: Prof. Bruce M. Hood, Dr. Nathalia Gjersoe, Dr. Richard Wise

Objectives: In sympathetic magical belief, objects are thought to be causally connected by dint of their similarity in appearance (Fraser, 1922). This belief underlies many herbal remedies, alchemy and voodoo witchcraft but is also evident in scientifically literate populations as an implicit bias (Rozin & Nemeroff, 1990). For instance, adults experience significantly higher galvanic skin responses when cutting up a picture of objects they care about than when cutting up photos of seemingly identical objects or personal belongings of greater financial value (Hood et al, 2010).

Methods: The current study explored the neural correlates of this response in 32 adults when shown destruction scenarios involving personal objects of sentimental or financial value as compared to controls. Importantly, participants always knew that their objects were safe in reality.

Results: Destruction scenarios involving a sentimentally valuable item elicited significantly greater activation in the insular and anterior cingulate cortex (ACC) relative to personal items of greater financial worth or controls.

Discussion and Conclusions: The insular in humans is associated with pain and loss and also experiencing anger and sadness while the ACC is associated with suppression of unwanted emotions. We interpret this finding as evidence that scientifically educated adults implicitly endorse sympathetic magical beliefs but attempt to suppress this bias. The results are the first exploration of the neural correlates of a seemingly irrational bias that has been described extensively in anthropological and psychological literature.

Publications:
Cunningham, W.A., Johnson, M., Raye, C., Gatenby, C., Gore, J.C. & Banaji, M.R. (2004). Separable neural components in the processing of Black and White faces. *Psychological Science*, 15, 806-813.
Frazer, J.G. (1922). *The Golden Bough: A study in magic and religion*. London: Macmillan.
Hood, B.M., Donnelly, K., Leonards, U., & Bloom, P. (2010). Implicit voodoo: electrodermal activity reveals a susceptibility to sympathetic magic. *Journal of Culture and Cognition*, 3(4), 391-399 (Appendix A)
Rozin, P., & Nemeroff, C. J. (1990). The laws of sympathetic magic: A psychological analysis of similarity and contagion. In J.Stigler, G. Herdt, & R. A. Shweder (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 205-232). Cambridge, England: Cambridge University Press.

Keywords: sympathetic magical beliefs, neural correlates, irrational biase.

39/08 - "Anomalous Communication: The Transmission of Subjective Significance"
Instituição/*Institution*: Institute for Frontier Areas of Psychology and Mental Health (IGPP), Freiburg - Germany
Duração/*Duration*: 2009/02 - 2011/09
Investigadores/*Researchers*: Dr. Wolfgang Ambach, Dr. Tim Schönwetter

Objectives: We investigated anomalous correlations between physiological activity and events conventionally considered as unperceivable by means of the concept of the orienting response (OR). The physiological components of the OR are modulated by particular significance of stimuli. We questioned whether the subjective significance of an object for one partner of an emotionally related pair modulates the OR in a spatially separated partner confronted with a picture of the object.

Method: In the first study, we used a modified Guilty Knowledge Test (n = 52 pairs). In the second study, we used a modified guessing task with partner event (n = 48 pairs). This task was tested in a pretest study (n = 48). Electrodermal response amplitudes, heart rate changes, respiratory changes, and pulse activity were measured. We tested both paradigms for a confound of physiological responses with stimulus positions.

Results: Analyses revealed no physiological response differences between objects with and without particular significance for the partner ($d < 0.15$, $p > .1$). Methodological analyses showed significant response differences between stimulus positions. In case of unbalanced stimulus positions, the estimation of the alpha level was biased.

Conclusions: This project provided no evidence for a modulation of the OR of the participants by the particular significance objects had for their partner. No other evidence for an anomalous effect was found. Analyses of the first and the pretest study were possibly biased by unbalanced stimulus positions; these were avoided in the second study.

Discussion: Unbalanced stimulus positions might have biased the alpha level in prior studies, which should be avoided by balancing in future studies. With respect to the OR concept, implications of this project suggest to study in more detail the influences of decision making and information processing on the OR.

Publications:
Schönwetter et al. (2011). Does autonomic nervous system activity correlate with events conventionally considered as unperceivable? Using a guessing task with physiological measurement. *Jour Parapsych (in press)*.
Schönwetter et al. (2011). Does a modified Guilty Knowledge Test reveal anomalous interactions within pairs of participants? Jour Parapsych,75.
Schönwetter, & Ambach (2010). Investigation of anomalous stimulus discrimination. (Poster abstract) *Abstr Pap Parapsych Assn 53rd Ann Conv*

Keywords: Psychophysiology, orienting response, anomalous communication, serial position effect

44/08 - "A Test of the Model of Pragmatic Information using European Cases of Anomalous Experiences"
Instituição/*Institution*: Koestler Parapsychology Unit, University of Edinburgh - UK
Duração/*Duration*: 2009/04 - 2012/01
Investigadores/*Researchers*: Dr. Caroline Watt, Dr. Ian Tierney

Objectives: A three-year study conducted the first systematic test of von Lucadou's Model of Pragmatic Information using spontaneous reports of Anomalous Experiences (AEs) of the Recurrent Spontaneous Psychokinesis (RSPK)-type. The study also aimed to stimulate collaboration amongst European centres for parapsychological research and individual researchers.

Method: Using a waiting-list design, collaborators asked members of the public who presented with AEs to participate in the web-based questionnaire study before detailed discussion about their AE. According to von Lucadou's Model, it was predicted that those randomly-selected cases that were viewed and documented in detail would show a reduction or change in AEs, compared to those that were never viewed and documented. The first year of the research programme, from December 2008, involved preparation of the study website and materials, and recruitment and briefing of collaborators. Ultimately, 16 different countries were represented. There was then a two-year period of data collection, which ended in September 2011. Rate of referrals to the study was considerably lower than estimated at the outset on the basis of initial contacts with potential collaborators.

Results: Following 43 referrals, a total of 17 cases passed the initial screening process, and 14 completed the full study, six of which were in the 'documented' group. Analysis of the two formal study hypotheses did not provide support for the predictions of the MPI, indeed results tended in the direction opposite to that predicted.

Conclusion: The Europsi project was successful in creating a network of collaborators active in parapsychology and clinical parapsychology, and facilitated communication amongst that group. The study website operated successfully, as the rejection rate was consistent with that predicted from previous research. The formal test of the MPI was of limited success due to low statistical power.

Discussion: Debriefing revealed that some collaborators reported a dramatic drop in the frequency of contacts from the public, which they largely attributed to the burgeoning popularity of amateur 'ghost' investigation groups and the ease with which the internet allowed such groups to be located. They also reported that in cases where the callers were in distress, they felt reluctant to delay assisting the caller by referring them to the study. All respondents indicated a willingness to continue to refer cases to the study website.

Publication:
Tierney, I. & Watt, C. (2010). A scientific test of the Model of Pragmatic Information using European cases of anomalous experiences. 53rd Annual Convention of the Parapsychological Association, Paris July 22-25th 2010.

Keywords: Model of Pragmatic Information; RSPK; Anomalous Experiences

45/08 - "Refining the methodology of alpha electroencephalographic biofeedback and exploring its effect on cognition and mood"

Instituição/*Institution*: Dept. of Applied Social Sciences, Canterbury Christ Church University - UK -, University of East Anglia Norwich - UK-, Dept. of Psychology, Avila University, Kansas City - USA - Siberian Branch of the Russian Medical Academy, State Institute for Molecular Biology and Biophysics, Nonvosibirsk - Russia

Duração/*Duration*: 2009/02 - 2012/01

Investigadores/*Researchers*: Dr. David Vernon, Dr. Soren Andersen, Dr. Neil Rutterford, Prof. Marcia Pasqualini, Dr. Olga Bazanova

Objectives: EEG biofeedback has been used to help train individuals to learn to consciously control certain aspects of their brainwave activity. However, a number of methodological questions remain concerning the nature of such training which limits our understanding of the process and the possible effectiveness of the technique. Hence the aim of this project was to examine more closely the nature of such training by using distinct reward thresholds, incorporating an equal contact mock feedback control group and performing follow-up measures to examine the possible long-term effects.

Methods: Using a standard pre/post intervention design we recruited 96 participants from four institutions (CCCU, RAMS, UEA and AU). Participants initially completed a range of cognitive (Conceptual Span Task; Mental Rotation Task, Alternative Uses Task) and mood measures (Profile Of Mood States, STAI, BIS/BAS). They were then randomly allocated to either a real or mock feedback condition utilising either a fixed low, medium, high or non-fixed variable reward threshold. All participants then completed 10 training sessions, approximately twice per week, with the aim to increase the amplitude of their alpha (8-12Hz) EEG rhythm. On completion of the training participants again completed the cognitive and mood measures, and again at follow-up after a delay of approx 4 wks.

Results: Initial analyses showed no evidence of a clear change in the EEG for those completing the biofeedback training. In addition, the differential reward thresholds had no effect on changes in EEG. A more fine tuned analysis, focusing on the effects of each institution, found that the biofeedback training enhanced the peak frequency, width and power in the individual upper alpha range (10-12Hz) but only for those with a low resting baseline frequency (<10Hz) and only in the Russian (RAMS) sample.

Conclusions: It would seem clear that the training paradigm adopted here was not effective in eliciting clear changes in the EEG.

Discussion: The project was less successful than anticipated in identifying potential methodological factors that could positively influence learning. Nevertheless, the pattern of findings not only provides a reasonable indication of what does not work but also highlights possible avenues for further exploration. For instance, the motivation level of the individual, identifying a possible distinction between responders and learners and using resting peak alpha levels as a marker for change.

Publication:

Vernon, D., Dempster, T., Bazanova, O., Rutterford, N., Pasqualini, M., Andersen, S. (2009). Alpha neurofeedback training for performance enhancement: reviewing the methodology. *Journal of Neurotherapy*, 13, 1-13.

Keywords: Alpha, Electroencephalograph, Biofeedback, Neurofeedback

48/08 - "ERP correlates of relational learning II: Testing a behavioural model of visual-visual and auditory-visual priming" – only abstract available
Instituição/*Institution*: Department of Psychology, Wales Institute of Cognitive Neuroscience, Swansea University, Wales - UK
Duração/*Duration*: 2009/09 - 2011/03
Investigadores/*Researchers*: Dr. Simon Dymond, Dr. Sara Tepaeru Minster

Objectives: The present study examined the behavioural and electrophysiological correlates of derived relational responding (stimulus equivalence).

Methods: Participants were trained, but not tested, for the formation of 4, 3-member stimulus relations (A1-B1-C1, A2-B2-C2, A3-B3-C3, and A4-B4-C4) consisting of pseudowords, before then receiving a relatedness decision task that presented all combinations of stimulus pairs (Directly Trained (i.e., A1-B1), Symmetry (i.e., B1-A1) and Equivalence (i.e., C1-B1), as well as Between Pair directly trained (i.e., A1-B2), symmetry (i.e., B1-A2), and equivalence (i.e., C1-B2) trials. Analyses compared each of these trial-types, as well as Within and Between comparisons. Thirty-five healthy controls were recruited. Twenty-one participants passed the final matching to sample test for derived relations.

Results: Behavioural results indicated that reaction times on Equivalence trials were significantly slower than all other trials types. Directly Trained trials were marginally faster than Symmetry trials (p=.49) and Equivalence trials (p<.000); Symmetry trials were significantly faster than Equivalence trials (p<.000); and Between trials were significantly slower than Within trials (p=.01). With the EEG data, a series of repeated ANOVAs were calculated across three frequency ranges (i.e., alpha, beta, and theta). Significant results for mean amplitude were typically found in the 4 to 8 Hz (theta) range, 350 ms after target onset, whereas peak mean amplitude differences were typically found in the theta range 250 ms after target onset.

Conclusions: Overall, equivalence trials evoked greater negativity than symmetry or directly trained trials. Further analyses are supportive of a derived relations approach to the electrophysiological correlates of relational learning.

Publications: Wang, T., & Dymond, S. (in preparation). *Event-related potential correlates of derived relational responding: Effects of prior testing*.

Keywords: ERPs, priming, equivalence relations.

54/08 - "Brain activity during remote information access"
Instituição/*Institution*: Institute of Medical Psychology and Behavioral Neurobiology, Eberhard-Karls-University, Tübingen - Germany
Duração/*Duration*: 2009/10 - 2011/06
Investigadores/*Researchers*: Dr. Jérôme Daltrozzo, Prof. Boris Kotchoubey, Dr. Ahmed A. Karim

Objectives: Illusory own-body perception (IOBPs) such as out of body experiences (OBEs) and distortion of body parts have attracted most interest when reported by patients suffering cardiac arrest and near death experiences, but they have also been reported to occur spontaneously in patients with epilepsy or migraine, during dreams and have been induced by electrical stimulation of the right temporoparietal junction (TPJ). However, the neurophysiological mechanisms involved in such illusory body perceptions remain elusive. Until now there have been worldwide only three patients, in which direct electrical stimulation of the cortex induced OBEs (for a review s. Ridder et al. 2007, *N Engl J Med*). The aim of this study was therefore to investigate in a larger sample under which conditions transcranial cortex stimulation can induce IOBPs.

Methods: In several experiments MRI-neuronavigated transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) were applied over specific brain regions in awake and in sleeping subjects. Continuous EEG recording was used to verify different sleep stages and to investigate neural correlates of IOBPs.

Results: Most remarkably, we found that only inhibition of the TPJ induced IOBPs in awake subjects. Neither high-frequency TMS of the TPJ nor low-frequency TMS of a control site induced such effects. Thus, our effects were area and frequency specific. Although none of our subjects reported OBEs, low-frequency TMS of the TPJ could induce illusory own body perceptions such as twitching sensations and illusory movements of body parts. Spectral EEG analyses revealed that IOBPs could only be induced, if the deactivation of the TPJ was associated with the deactivation of the frontopolar cortex.

Conclusions: Our data imply that the impairment of a temporoparietal *and* a frontal network is necessary for IOBPs. In a further study we investigated the effects of tDCS during sleep on own-body perception in dream reports. Compared with sham stimulation, a significant decrease in the subjective estimate of the amount of movements in the dream before awakening from REM sleep was found only after inhibitory tDCS.
Discussion: These studies reveal novel approaches for probing the neurobiology of IOBPs in the awake and the sleeping mind and might provide new insights in understanding the pathophysiology of neuropsychiatric disorders associated with abnormal own-body perceptions.

Selected Publications:
Karim AA (2010). Transcranial cortex stimulation as a novel approach for probing the neurobiology of dreams: Clinical and neuroethical implications. **International Journal of dream research**. 3(1): 17-20.
Karim AA, Gueler F., Daltrozzo J, Thielscher A, Kotchoubey B. (submitted). Debunking the role of the temporoparietal junction in out of body experience.
Noreika, V., Windt, J., Lenggenhager, B. & Karim, A. A. (2010). New Perspectives for the study of lucid dreaming: From brain stimulation to philosophical theories of self-consciousness. **International Journal of Dream Research**. 3(1), 27-36.

Keywords: transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), neural correlates, out of body experience (OBE), dreams.

63/08 - "Experimental tests of the role of consciousness in the physical world"
Instituição/*Institution*: Institute of Noetic Sciences, Petaluma, California - USA
Duração/*Duration*: 2009/02 - 2011/02
Investigadores/*Researchers*: Dr. Dean Radin, Dr. Paul Wendland, Eng. Robert Rickenbach, Dr. Cassandra Vieten

Objectives: A double-slit optical system was used to test the possible role of consciousness in the collapse of the quantum wavefunction. The ratio of the interference pattern's double-slit to single-slit spectral power was predicted to decrease when attention was focused towards the double-slit as compared to away.

Methods: Each test session consisted of 40 counterbalanced attention-towards and attention-away epochs, where each epoch lasted between 15 and 30 seconds.

Results: Data contributed by 137 people in six experiments, involving a total of 250 test sessions, indicated that on average the spectral ratio decreased as predicted (z = -4.36, p = 6 x 10-6). Another 250 control sessions conducted without observers present tested hardware, software, and analytical procedures for potential artifacts; none were identified (z = 0.43, p = 0.67). Variables including temperature, vibration, and signal drift were also tested, and no spurious influences were identified. By contrast, factors associated with consciousness, including meditation experience, electrocortical markers of focused attention, and psychological factors including openness and absorption correlated in predicted ways with perturbations in the double-slit interference pattern.

Conclusions: The results appear to be consistent with a consciousness-related interpretation of the quantum measurement problem.

Discussion: Previous studies with random number generators (RNG) have provided evidence for mind-matter interactions, but those effects are difficult to model. The present experiment allows for direct comparison of the observed data against a theoretical model of wave interference. This offers the possibility of determining what components of the double-slit system appear to influenced by focused awareness, and this in turn may offer clues about how mind interacts with matter.

Publications: In press (2012), *Physics Essays,* 25:2.

Keywords: double-slit, quantum measurement, intention, mind-matter interaction

71/08 - "Emergent information in the visual environment: the role of fractal dimension in anomalous information acquisition" – only abstract available
Instituição/*Institution*: Bournemouth University, Poole - UK
Duração/*Duration*: 2009/02 - 2011/04
Investigador/*Researcher*: Dr. Paul Stevens

Objectives: This study aimed to (1) determine if fractal dimension represented a cue which maps onto some basic human desires: a healthy environment, the presence of water, and a sense of spirituality; (2) understand relationships between the fractal dimension of visual scenes, human physiological responses to such scenes and self-reported preference for a visual environment.

Method: In Phase 1, fractal dimension of the treeline/sky silhouette was calculated for images in 3 categories: depth of underground water levels, (ii) perception of the site as being sacred or secular, and (iii) the surveyed biodiversity (species richness) of the areas within which an image was taken. In Phase 2, 50 unselected participants viewed and preference-ranked sets of images from the 3 categories while their skin conductance responses (SCR) were recorded.

Results: Phase 1 showed no significant difference between “sacred” vs “secular” sites and fractal dimension (W=174, N=40, p=0.25). Differences for water-depth were close to significance (shallow vs deep : W=23, N=18, p=0.07) and for biodiversity sites were significant (high vs low: W=25, N=40, p=1.34x10-7). Phase 2 showed a significant negative relationship (r = -0.11, p = 0.03) between participant SCR magnitude and fractal dimension, and a positive correlation between expressed preference and fractal dimension (rho = 0.61, p= 0.03).

Conclusions: Results support the idea that visual complexity of a scene (known to influence preference) relates both to useful information about a site (water depth and biodiversity) and to our level of arousal upon seeing that site.

Discussion: This study gives the first supporting evidence for the idea that humans have an ability to recognise and prefer environments that are ecologically healthy (biodiverse and having a near-to-surface water table). As water depth showed a negative correlation to fractal dimension, which showed a negative correlation related to skin conductance response, near-to-surface water should show a relaxation response that could be expressed via ideomotor action, suggesting that visual factors in dowsing studies might be a useful area to pursue.

No publications yet available

Keywords: visual perception, evolutionary psychology, fractals, dowsing

73/08 - "Learning and Generalization on Psi Perceptual Tasks" – only abstract available
Instituição/*Institution*: Visual Perception, Cognition, and Neuroscience Laboratory, Department of Psychology, Northwestern University, Evanston - USA
Duração/*Duration*: 2009/01 - 2011/04
Investigador/*Researcher*: Dr. Julia Mossbridge

Objective: First we aimed determine whether conscious awareness of future events could be trained. Next we used physiological markers to determine whether humans have subconscious awareness of future events.

Methods: In the training experiment, participants were placed into 1 of 3 groups: trained on a precognition task (N=3), trained on a biofeedback program (N=9), and no training (N=3). The two training groups received fifteen 30-min training sessions over 2-3 months.
On each of 25 trials in the physiology experiments, participants were presented with 4 photos and were asked to select a "target" image. The software then used a hardware random number generator to randomly choose one of the four photos as the target image and a full-screen version of this image was displayed. The dependent variables were the mean normalized heart rate and skin conductance during the 10 seconds preceding the presentation of feedback.

Results: In the training experiments, measurable improvements in precognition were not found for either of the training regimens we used.
For the physiology experiments, results were inconsistent. In a first (N=39) and second (N=15) precognition experiment, skin conductance data revealed no effect, but mean heart rate decreased significantly prior to correct (vs. incorrect) responses. However, a third (N=30) and fourth (N=29) experiment did not reveal any significant results.
To address across-gender variability as well as potential influences from previous trials, in a post-hoc analysis we combined physiology data *only from the first trials of each session* in the four experiments, separately for the two genders. There were no heart rate effects. Data from men revealed a significant increase in skin conductance preceding correct vs. incorrect trials. Data from women showed an opposing trend (sex x correctness interaction: $p<0.007$).

Conclusion and Discussion: Conscious awareness of future events is not learnable using the training regimens used here. Subconscious awareness of future events in guessing tasks seems to be a weak phenomenon that can be masked by both inter-individual and inter-trial variability. Future work investigating the mechanisms of precognition should focus on subconscious awareness, examine male and female performance separately (Radin and Lobach 2007), and account for effects of previous trials.

Publications:
Mossbridge J, Grabowecky M, Suzuki S (2009) Evidence for Subconscious but not Conscious Psi in Remote Stare Detection and Precognition Tasks. Proceedings of the 52th Annual Convention of the Parapsychological Association:12-13.
Mossbridge J, Grabowecky M, Suzuki S (2010) Disparate heart rate changes precede correct vs. incorrect guesses. Toward a Science of Consciousness, Tucson, AZ. 160-161.
Mossbridge J, Grabowecky M, Suzuki S (2011). Physiological markers of future outcomes: Three experiments on subconscious psi perception during concurrent performance of a guessing task. Proceedings of the 54th Annual Convention of the Parapsychological Association:17. Mossbridge JA, Utts J, and Tressoldi P. (in revision). Predictive anticipatory activity preceding unpredictable stimuli: A meta-analysis.

Keywords: psychophysiology, temporal processing, pre-stimulus physiological measures, anticipatory responses

74/08 - "Cortical Oscillations and Altered States of Consciousness: The Study of Meditative States and Functional Brain Connectivity"
Instituição/*Institution*: The Hospital for Sick Children, Toronto - Canada
Duração/*Duration*: 2009/08 - 2011/10
Investigadores/*Researchers*: Prof. Jose Luis Perez Velazquez, Prof. William Gaetz

Objectives: The purpose of our research is to study the coordinated collective cortical activity derived from magnetoencephalographic (MEG) recordings during the practice of meditation. Some publications demonstrated an enhancement of synchronization of brain signals (scalp electroencephalographic recordings) during meditation. However other results have cast some doubt in these observations; specifically, studies that showed that gamma activity inferred from scalp EEG recordings is largely the result of increased tone in head muscles that closely associates with brain function.

Methods: MEG recordings were taken of participants (“experts” as those with >4 years of practice, and novices) during a control period and during one-pointed (samatha) and insight (vipassana) meditation. In addition, simultaneous electromyographic (EMG) recordings were taken to assess scalp muscle activity. The neurophysiological activity (MEG signals) is analysed in terms of phase synchronization at different frequency bands from 4 to 35 Hz.

Results & Discussion: The EMG signals of scalp sensors showed that there was no increase in power at any frequency during meditation in the “expert” group, hence these results do not support our hypothesis of a possible enhancement of muscle activity during meditation practice. No significant change in synchronization amongst the MEG sensor signals during meditation was noted, thus we could not reproduce previous published results with expert practitioners. This could be due to several factors: 1) we used MEG and not EEG (EEG uses a common reference and that poses problems when assessing synchrony); 2) our subjects performed other types of meditation; and finally, 3) other studies used monks with a level of expertise probably much higher than that of our participants.

Conclusions: Two likely conclusions may be apparent from the comparison between our results and those of other studies. The differences may be due to the distinct methods used for recording of brain signals or, if this were not to be the case (to prove this, the exact same analysis would have to be done on all sets of data and ideally by one group), then the other inference is that the neurophysiological changes at the level here studied (synchronization) only appears after very extensive meditation practice.

Keywords: Meditation; magnetoencephalography; phase synchrony.

77/08 - "How do you know what others feel? A psychophysiological study of social cognition and aging" – only abstract available

Instituição/*Institution*: Human Cognitive Neuroscience Research Group, Department of Psychology, University of Edinburgh - UK

Duração/*Duration*: 2009/01 - 2011/02

Investigadores/*Researchers*: Dr. Sarah MacPherson, Ms. Edyta Monika Hunter, Prof. Louise H. Phillips

Objectives: Efficient navigation of our social world depends on the generation, interpretation and combination of social signals within different sensory systems. However, the influence of adult aging on cross-modal integration of emotional stimuli remains poorly understood. Therefore, the aim of this work is to understand the integration of visual and auditory cues in social situations.

Methods: A series of multisensory integration experiments were designed to compare the ability of younger and older adults to identify whether emotional faces and voices were presented congruently or not. In an additional eye tracking experiment, younger and older adults were compared in terms of their gaze behavior when identifying emotions through multiple sensory modalities e.g. face and voice versus unisensory modalities e.g. face or voice.

Results: The results suggest that older adults are significantly less accurate at correctly identifying emotions from one modality (faces or voices alone) but perform as well as younger adults on tasks where congruent auditory and visual emotional information are presented concurrently. In contrast, older adults are poorer than younger adults at detecting incongruency from different sensory modalities. Furthermore, older adults who looked for a shorter time at the eye and mouth regions are better at detecting cross-modal congruence than older adults who looked for longer. In contrast, younger adults who looked longer at the whole face i.e. the eyes, mouth and the periphery of the face perform best in congruence detection.

Conclusions and Discussion: Across the studies we found clear evidence that older adults had difficulty in identifying emotions from faces and voices. However, these age differences in emotion perception disappear when congruent multimodal information was available. Therefore, older adults appear to benefit from congruent multisensory information. Moreover, the results suggest that the age differences in the processing of relevant and irrelevant visual and auditory social information might be related to changes in gaze behaviour.

Publications:

Hunter, E.M., Phillips, L.H., & MacPherson, S.E. (2010). Effects of age on cross-modal emotion perception. **Psychology & Aging, 25(4),** 779-787.

Keywords: aging, multisensory integration, social cognition, eye tracking

79/08 - "Absorption Experiences and their relationships to dreams, imaginary companions and Parapsychological experiences"
Instituição/*Institution*: Division of Perceptual Studies, University of Virginia Health System - USA
Duração/*Duration*: 2009/10 - 2011/09
Investigadores/*Researchers*: Prof. Nancy L. Zingrone, Prof. Carlos S. Alvarado

Objectives: Conducted with Dr. Carlos S. Alvarado, the research described here was an exploratory survey of the relationship of Tellegen's Absorption Scale (TAS) scores, the frequency of absorption experiences and, adult memories of childhood imaginary companions, and dream-related, mystical, déjà vu, synesthesia-like and seemingly psychic experiences.

Method: Two surveys were conducted, one a random survey of the population of Richmond, Virginia (S1) and the other, an English-language web-based volunteer survey (S2).

Results: 263 individuals completed the random survey and 622 the web-based survey. S2 respondents obtained higher TAS scores, and claimed more of all other experiences surveyed. 14% S1 respondents claimed childhood imaginary companions compared to 26% S2 respondents. For both groups, TAS scores were significantly higher for those who remembered imaginary companions (IC-Yes) than for those who did not (IC-No) (Mann-Whitney z scores, $S1z = 4.23$, $S2z = 6.61$, $p < .0001$), as were frequency of absorption experience scores ($S1z = 4.03$, $S2z = 6.96$, $p < .0001$). IC-Yes and IC-No groups differed significantly in S2 on frequency of dream-related, seemingly psychic, mystical, déjà vu, and synesthesia-like experiences while in S1, disturbing dreams, mystical and déjà vu experiences were not significantly different when parsed by IC-Yes/IC-No. TAS scores and absorption frequency scores correlated with other experiences in both surveys, with differing patterns of significance. For example, of the significant outcomes, TAS scores correlated most highly with the frequency of lucid dreams ($rs = .498$), claimed apparitional experiences ($rs = .538$), mystical experience ($rs = .581$) and synesthesia-like experiences of color with music ($rs = .614$) in S1, but with dream recall frequency ($rs = .283$), claimed ESP experiences during dreams ($rs = .489$), and déjà vu ($rs = .524$) in S2.

Conclusion/Discussion: This research replicated results of previous studies we have conducted in that they show a consistent set of relationships between exceptional experiences and with such psychological states/traits as absorption. Future research that includes measures of psychological and psychosocial adjustment is warranted.

Keywords: Absorption, Imaginary Companions, Exceptional Experiences

83/08 - "Measurement and Analysis of Interindividual Psychophysiological Differences in Experienced Meditators"
Instituição/*Institution*: Institut für Umweltmedizin und Krankenhaushygiene, Universitätsklinikum Freiburg - Germany
Duração/*Duration*: 2009/10 - 2011/03
Investigadores/*Researchers*: Dr. Thilo Hinterberger, Dr. Niko Kohls

Objectives: Numerous studies using electroencephalography (EEG) have shown how brain physiological signals correlate with processes of cognition, awareness and states of consciousness during meditation. While most experimental EEG studies report only on one specific group of meditators we have measured experienced meditators from various traditions assuming a methodological overlap between many practices. We assessed their meditation methods, self-rated mindfulness and exceptional experiences. Correlating those subjective measures with physiological data is supposed to give an objective estimate of the validity of these subjective concepts and experiences.

Methods: Fifty participants with various meditation experiences ranging from no experience to more than 10.000 hours of meditation have been measured with 64-channels of EEG. The measurements consisted of resting states, a self-selected personal meditation session, and a short guided meditation in which different meditative tasks.

Results: The connection between mindfulness, a positive evaluation of mystical experiences, and a decreased psychopathology could be demonstrated in subjective self-ratings but also in the gamma activity of resting state EEG. The same could be observed in the EEG coherence of beta band activity. While meditation essentially was found to be a state of reduced lower frequencies, the beta1 amplitudes seem to increase in parietal areas similarly to the state of presence. Also, meditation experience and mindfulness are correlated with mental health and positive experiences.

Discussion: The results, especially high frequency EEG correlations, strongly support the idea that a state of mindful presence and an attitude of acceptance are closely related to psychological health and a positive acceptance of mystical experiences while it is negatively correlated with psychopathological experiences. Highly significant brain state changes between various meditative tasks in experienced meditators indicate that meditation trained persons show higher brain dynamics than less experienced people.

Conclusions: The results suggest the hypothesis that experienced meditators may be able to experience themselves in more different ways offering them a higher range of mental possibilities compared to non-meditators. Further, due to its
physiological correlates the concept of mindfulness seems to be more than a subjective self-esteem.

Publications:
Abstracts and conference talks:
Hinterberger T., "Electrophysiological state changes during meditative spiritual practice", presentation at the TASK II Conference in Bad Tölz, September 10-11, 2009.
Hinterberger T., “Monitoring of Brain States During Meditation in Practitioners from Various Traditions: Methods and Results”, presentation at the Neuroscience, Consciousness and Spirituality II expert meeting on “Meditation: Neuroscientific Approaches and Philosophical Implications” in Freiburg i. Br., Feb. 25-27, 2010.

Hinterberger T., “Monitoring of Brain States during Meditation: Methods and Results”, presentation at the 2nd European Conference on Religion, Spirituality and Health in Bern /Switzerland, May 13th-15th, 2010.
Hinterberger T., „Psychophysiologisches Monitoring von Bewusstseinszuständen während meditativer Praxis“, presentation at the TASK III Conference in Witten-Herdecke, September, 2010.
Book chapters:
Hinterberger, T., Kohls, N., Kamei, T., Feilding, A., Walach, H. "Neurophysiological correlates to psychological trait variables in experienced meditative practitioners", Special Issue on Spirituality and Religion, Springer, in press.
JOURNAL ARTICLES:
Hinterberger, T. & Kohls, N., „Physiological markers of a psychological concept of mindfulness”, (in preparation).
Hinterberger, T. & Sauer, S. „The Psychophysiology of Mindfulness in Meditative Practice”, (in preparation).
Halsband, U., Hinterberger, T., „Veränderungen der Plastizität im Gehirn unter Hypnose“, Hypnose: Zeitschrift für Hypnose und Hypnotherapie, Band 5, pp. 33-50, 2010.
Hinterberger, T., Schöner, J., and Halsband, U., "An Analysis of EEG State Transitions during Hypnosis Induction", International Journal of Clinical & Experimental Hypnosis, DOI: 10.1080/00207144.2011.546188. 59(2): pp. 1-15, 2011.

Keywords: Neuroscience, Consciousness, Meditation

89/08 - "The Neuropsychophysiological Basis of Empathy: The role of neuroendocrine; autonomic and central nervous system variables"

Instituição/*Institution*: CIPsi – Centro de Investigação em Psicologia, Universidade do Minho, Braga - Portugal

Duração/*Duration*: 2009/01 - 2012/03

Investigadores/*Researchers*: Prof. Óscar Filipe Coelho Neves Gonçalves, Dr. Patrícia Silva, Dr. Ana Pinheiro

Empathy comprises the ability to understand another person's thoughts and feelings, separate our own thoughts and emotions from those of the observed, respond with the appropriate prosocial and helpful behavior, and resonate with his/her emotions. Some components of the empathic processes, such as emotional contagion and theory of mind, have been abundantly explored in several studies, however few studies have considered the neurobiological mechanisms underlying the empathic response.

Objectives: The present study explores psychophysiological correlates (skin conductance level and the interbeat interval) as a function of the empathic response while participants watch and respond to actors portraying emotionally laden vignettes.

Methods: Forty undergraduate psychology students were each presented with 40 emotional vignettes of positive or negative valence and asked to choose among three different empathic responses while their electrodermal and cardiac responses were measured.

Results: The study shows that higher levels of empathy are associated with increased cardiac activity (i.e., decreased Interbeat Interval) but not with electrodermal activity.

Discussion: This finding suggests that the cardiovascular activity appears to be sensitive to the level of empathic response to emotionally laden vignettes, and in turn, this may represent an important autonomic biomarker of additive empathic response. Multiple biological subsystems are known to regulate the cardiovascular activity, making it highly sensitive to many psychological processes, such as attention, memory, brain reward, etc.

Conclusion: This specific sensitivity makes the cardiac response a good candidate for a biomarker of more complex and multidimensional processes such as the empathic response. More consideration will be also given to possible role of cardiac reactivity as a biomarker of the empathic response.

Publications:

Oliveira-Silva, P., Gonçalves, O. F. (2011). Responding empathically: a question of heart, not a question of skin. *Applied Psychophysiology and Biofeedback,* 36(3), 201-7.

Carvalho, S., Leite, J., Galdo-Álvarez, S., & Gonçalves, O. F. (2011). Psychophysiological Correlates of Sexually and Non-Sexually Motivated Attention to
Film Clips in a Workload Task. *PLoS ONE,* 6(12): e29530. doi:10.1371/journal.pone.0029530.

Keywords: Empathy, Electrodermal activity, Interbeat interval.

94/08 - "Manipulação da Emoção em Ambientes de Realidade Virtual Imersiva: Validação Metodológica" - "Emotion manipulation in environments of immersive virtual reality: methodological validation"

Instituição/*Institution*: UnIPSa – Unidade de Investigação em Psicologia e Saúde: Laboratório de Psicofisiologia / Grupo de Psicobiologia / Instituto Superior de Ciências da Saúde – Norte, Paredes - Portugal

Duração/*Duration*: 2009/01 - 2011/10

Investigadores/*Researchers*: Dr. Luís Manuel Coelho Monteiro, Prof. João Eduardo Marques Teixeira, Prof. Manuel Fernando dos Santos Barbosa, Prof. Jorge Manuel Amaral Silvério

Objectives: The traditional method of induction of emotion in the investigation of mental illness with affective disorders refers to the display of photographs contained in conventional image banks. Features like the feeling of presence, immersion and interaction, not to be contemplated in this type of methodological paradigms, limit the ecological validity and perhaps the emotional loading. The purpose of this study was to verify whether the intensity of emotional response induced by 3D is superior to that obtained in 2D traditional paradigms, aiming at its application in basic and applied research to mental health.

Methods: 30 healthy participants viewed stimuli that induce emotion in two visualization methods: 2D vs 3D. The visualization of the stimuli was performed in a Virtual Theatre with active stereoscopic projection using the shutter glasses. The emotional valence was manipulated March 2 conditions - unpleasant vs. neutral vs. pleasant. Each stimulus was displayed for 15sec and sorted through the pictographic scales Arousal and valence of the Self-Assessment Maniquin (Lang, 1980).

Results: The results showed that visualization of 3D stimuli cause greater arousal responses to pleasant and unpleasant conditions.

Conclusion: Immersion, presence and possibility of interaction due to stimulation by 3D technology, are key aspects that can lead to increased intensity of the emotional response of the subject, approaching it more from the contingencies of real life. Thus, the use of 3D technology shows great potential for the study of emotion in people with such disorders.

Keywords: Emotion, Virtual Reality, Stereoscopic stimulation, Arousal, Self-Assessment Maniquin.

102/08 - "Susceptibility to affect-based framing effects as a predictor of psychic experience"
Instituição/*Institution*: Centre for the Study of Anomalous Psychological Processes, School of Social Science, The University of Northampton - UK
Duração prevista/*Estimated duration*: 2009/05 - 2012/04
Investigador/*Researcher*: Prof. Richard S. Broughton

Objectives: This project explores a model of extrasensory perception proposed by the author that suggests that the emotional system, particularly the components that encode and retrieve feelings, have been co-opted by evolution to work with memory systems to present anomalous information in a manner that enables humans to make more adaptive decisions. The project uses the framing effect, a robust psychological effect in which problems are presented or 'framed' in such a way that the responses reflect emotional sensitivity to the framing context. Using two different forms of the framing effect this project aims to determine if individual differences in susceptibility to the framing effect are related to the tendency to have psychic experiences and psychic ability.

Methods: Participants complete a broad-based spectrum of personality and trait questionnaires, including the IPIP equivalent of the NEO-FFI, an emotional decision-making survey (IPIP), Epstein's Rational-Experiential Inventory, and the Australian Sheep-Goat Scale. These are completed on-line. Susceptibility to the framing effect is measured in two ways. One uses a unique format of the 'Asian Disease Problem' designed to assess individual differences and the other is a computer-based financial risk framing test developed by DeMartino and colleagues.
Participants in the upper and lower quartiles on a combined framing susceptibility measure will be compared in performance on two tests of anomalous intuition, the Intuitive Market Trader (IMT), a market trading simulation test of precognition developed by the author, and a computer based test of remote viewing developed by the Laboratories for Fundamental Research.

Results: Results are not yet available, but will be available at the symposium. The project is continuing with over 100 participants enrolled and over 80 completed toward the planned number of 160 Full analysis will include an investigation of possible relationships between personality, cognitive style, framing susceptibility, and anomalous experiences.

Conclusions and discussion: to be available at the symposium.

Keywords: intuition, framing effect, emotions, precognition, evolution

122/08 - "Mindfulness and emotional factors contributing to intuitive decision-making in the medical settings"

Instituição/*Institution*: Mind Brain Mindfulness research group (MBM) of the Institute of Computing and Information Sciences (ICIS), Nijmegen - The Netherlands

Duração prevista/*Estimated duration*: 2009/10 - 2012/03

Investigadores/*Researchers*: Prof. Henk Barendregt, Dr. Stephen Whitmarsh, Dr. Eva Lobach, Prof. Dick J. Bierman, Dr. Fabio Giommi

Objective: To contribute to the understanding of intuitive decision-making through investigating the effectiveness and psycho-physiologically basis of the “gut-feeling”.

Method: For five consecutive days participants conducted a working memory (WM) experiment where apparently random consonant-sequences had to be retained and reproduced. Unbeknownst to the subjects these were generated by a complex artificial grammar. To study the gradual acquisition of a preference for this grammar, subjects conducted a preference task at day one, two and five. While evaluations where being made Galvanic Skin Response, heart rate and pupil dilation where measured. Finally, subjects where debriefed about the grammaticality of the WM sequences and explicitly asked to judge a series of sequences on their grammaticality, under similar psycho-physiological measurements. To investigate the *causal* role of affective processes in intuitive decision-making, every presentation in the preference (and final evaluation-) task was preceded by very short (~30ms) and thereby unconsciously perceived, emotional images. Since we hypothesized that intuitive decision-making partly relies upon accurate reading of one's affective ('gut-feeling') state, and that such skills vary within the population, we also measured mindfulness skills through questionnaires.

Results: Subjects where shown to implicitly extract complex grammatical regularities while being unable to verbally report these. According to the Somatic Marker Theory (SMT) we expected the sympathetic system to provide emotionally coded information about the learned implicit associations. Results suggest that the somatic responses indeed paralleled the acquisition of implicit knowledge, as shown previously with the Ohio Gambling Task (OGT). Further measurements and analysis of priming effects and individual differences are in progress.

Discussion and conclusion: The simplicity of the OGT has been one of the main concerns of the paradigm and the SMT (Maia & McClelland (2004), *Trends Cogn Sci*). Another concern has been the fact that a reversal of the reward/punishment
scheme has been shown to reverse the anticipatory GSR (Tomb et al. 2002, *Nat Neurosci).* Our replication in a complex task without any reward/punishment schemes contributes to the understanding of the psycho-physiologically basis of the intuitive decision-making in terms of the SMT.

Keywords: intuition, mindfulness, learning, priming

127/08 - "Prefrontal control of impulsive action" – only abstract available
Instituição/*Institution*: Instituto Gulbenkian de Ciência, Oeiras - Portugal
Duração/*Duration*: 2009/02 - 2011/03
Investigadores/*Researchers*: Dr. Masayoshi Murakami, Dr. Zachary F. Mainen

Objectives: Impulse control - withholding short term benefits to achieve longer term goals - is an important facet of goal-directed behavior. Frontal cortex has been hypothesized to exert top-down control of impulsive actions. Some of the neural substrates of decisions between immediate and delayed rewards are identified, including the brain systems involved and properties of the neural representations. Comparatively little is known about decisions to terminate waiting during a delay. In particular, in a decision to give up, the time is determined by an internal battle between the "will" to wait and the "temptation" to give up. What neural processes underlie the timing of such acts?

Methods: We devised an impulse control task in which rats interacted with a waiting port and a reward port. While waiting in the waiting port, size of the reward available at the reward port switched from small to big following a signaled but unpredictable interval. In order to record spiking activity from multiple neurons, we implanted movable tetrode arrays into the frontal cortex of rats trained for the impulse control task.

Results: The waiting time of the rats in our impulse control task varied randomly across trials. This enabled us to search for single-neuron correlate for impulse control. Through multiple single-unit recordings from the frontal cortical areas, we found neurons whose activity showed transient correlation with the waiting time. There were 20% of such waiting time predictive neurons in secondary motor area (M2) of frontal cortex, but close to chance level (7%) in the medial prefrontal cortex. The predictive neurons might contribute to bias the waiting time toward longer waiting or shorter waiting. A different analysis revealed that a subpopulation of neurons in the area M2 showed ramping activity during the waiting, which reached the same firing rate just before the leaving. The rate of ramping activity was negatively correlated with the waiting time in a majority of ramping neurons. This type of activity is proposed to serve as an internal trigger for actions. When we tested the neural activity in 2 different impulse control tasks requiring different actions, most of neurons showed the predictive activity in only one type of actions, suggesting that the waiting time predictive activity does not represent action-non-specific signal such as an impulse control signal, but represents action-specific signal, such as the timing of a particular action.

Conclusions: These results suggest an involvement of M2 neurons in deciding the timing of action in the context of impulse control task.

Discussions: Our finding suggests that the waiting time predictive neurons represent action timing signal rather than abstract signal, such as a value of options or internal state of the animal. But such abstract signals might be encoded in prefrontal cortical areas, such as the orbitofrontal cortex, which sends signal to the secondary motor cortex.

Publications: Proceedings and meetings
Masayoshi Murakami, Maria I. Vicente, Gil M. Costa, Zachary F. Mainen, Role of medial prefrontal cortex and secondary motor cortex in withholding impulsive action, Computational and Systems Neuroscience 2009, Salt Lake City, Utah

Masayoshi Murakami, Maria I. Vicente, Gil M. Costa, Zachary F. Mainen, Neural substrates of withholding impulsive actions in rat frontal cortex, 7th Forum of European Neuroscience, Amsterdam, 2010

Keywords: medial prefrontal cortex, secondary motor cortex, single-unit recordings, behavior, impulse control

130/08 - "As Experiências Óptimas na vida diária e Padrões Fisiológicos associados: para um conhecimento da Personalidade Autotélica" - "Optimal experiences in daily life and associated physiological patterns: towards an understanding of the autotelic personality"

Instituição/*Institution*: Centro de Investigação em Psicologia (CIPsi), Universidade do Minho, Braga - Portugal

Duração/*Dration*: 2009/01 - 2011/09

Investigadores/*Researchers*: Prof. Teresa Freire, Dr. Mário João Pereira Sequeira Santos, Prof. Marta Bassi, Dr. Gabriela Matias

Objectives: The autotelic personality is associated with traits associated with positive mental and physical health outcomes. Furthermore, the autotelic personality was associated with a better functioning in daily life contexts. The aim of this study was to investigate whether autotelic personality characteristics are associated with experiential and physiological momentary responses to daily life contexts.

Methods: Sixty-seven female college students from the University of Minho, Portugal, used the Experience Sampling Method during a week, completing questionnaires and collecting saliva samples 8 times daily. We performed multi-level analyses to investigate the effects of autotelic personality characteristics on subjective experience and cortisol secretion.

Results: Autotelic students experienced lower negative affect and fatigue, and higher levels of engagement in daily life, than less autotelic students. In solitude, autotelic students did not experience heightened negative affect in solitude as their less autotelic individuals did. Although daily solitude was associated with heightened cortisol levels, we did not find a moderating effect of autotelic personality on cortisol levels in solitude.

Conclusions: Current results shed new clues about the assessment of the psychophysiology of the autotelic personality. Findings help clarify how daily contexts influence the affective and neuroendocrine responses of individuals, contributing for future health outcomes.

Discussion: We discuss future directions such as the inclusion of other physiological measures (e.g., salivary alpha-amylase) and the study of different moments in time to understand the effects of positive personality characteristics on processes such as adaptation and health outcomes.

Publications:

Matias, G.P., & Freire, T. (2009) Experiência Óptima e Cortisol: A Psicofisiologia no Quotidiano. *Psychologica*, 50, 233-248.

Matias, G.P., Nicolson, N.A., & Freire, T. (2011) Solitude and cortisol: Associations with state and trait affect in daily life. *Biological Psychology, 86*(3), 314-319. doi: 10.1016/j.biopsycho.2010.12.011 2/2

Matias, G.P., & Freire, T. (2009) Cortisol awakening response and the autotelic personality: an exploratory study. *Psychology & Health*, 24(1), 71-419.

Matias, G.P., Nicolson, N.A., & Freire, T. (2010) Cortisol and the experience of being alone in daily life. *Psychology & Health*, 25(1), 137-376.

Keywords: autotelic personality, flow model, daily life, cortisol.

134/08 – "How does cognitive enrichment impact on neuronal networks and behavioral performance?"

Instituição/*Institution*: Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga - Portugal

Duração prevista/*Estimated duration*: 2010/05 - 2012/04

Investigadores/*Researchers*: Prof. João José Fernandes Cardoso de Araújo Cerqueira, Dr. Igor L. M. Spínola, Dr. Irene Melo Carvalho, Dr. Pedro Ricardo Luís Morgado, Dr. Ricardo Jorge Moreira Taipa

Introduction: Several studies in animal models have demonstrated that chronic stress exposure induces alterations in the structure and function of the hippocampal formation and medial prefrontal (mPFC). Also relevant, was the finding that such functional and structural changes partially reverted following cessation of stress exposure; importantly, functional recovery was correlated with synaptogenesis and dendritic plasticity, at least in the hippocampus.

Objective: The present study aimed to assess the ability of cognitive stimulation to abrogate the negative effects of chronic stress exposure on learning and memory performances.

Methods: As it is conceivable that specific cognitive stimulation differently enhance brain circuits, rats free of stress-exposure (CON) and animals previously submitted to chronic unpredictable stress (CUS) were submitted to spatial reference memory stimulus using the hole board (RM) paradigm (CON+RM and CUS+RM) while others were trained in a T-maze (WM), a working memory tasks (CON+WM and CUS+WM).

Results: Behavioral data confirms that stress impairs both reference and working memory. Importantly, these behavioural underperformances were reverted with cognitive tasks. Interestingly, however, each individual task ameliorates predominantly that specific cognitive behaviour, which reinforces the view that neuronal plasticity is circuit-dependent. Structural analysis of animals submitted chronic stress reveals a trend to recovery of neuropil changes in the hippocampal formation, but not in the mPFC, after reference memory stimulation (CUS+RM). Conversely, after working memory stimulation there's a trend towards recovery of neuropil changes in the mPFC but not in the hippocampus.

Conclusion and discussion: In conclusion, these preliminary results suggest that reinforcement of specific cognitive circuits ("cognitive-enrichment") triggers synaptic plasticity mainly within the brain circuits implicated in that particular task. These basic experimental procedures provide an insight on the ability to recover from stress-induced impairments in animal models, which might prove relevant in the pathogenesis and recovery of several neurological and psychiatric disorders.

Publications:

Oliveira JF, Dias NS, Correia M, Gama-Pereira F, Lima A, Jacinto L, Ferreira D, Reis J, Cerqueira JJ, Sousa N "Chronic stress disrupts neural coherence between cortico-limbic structures" submitted.

Keywords: Chronic stress, plasticity, long-term potentiation.

146/08 - "Life-Span Changes in Electrophysiological Patterns Associated with Temporal Discrimination"

Instituição/*Institution*: Department of General Psychology, University of Padua - Italy
Duração/*Duration*: 2009/01 - 2012/02
Investigadores/*Researchers*: Prof. Patrizia Bisiacchi, Prof. Giovanni Sparacino, Dr. Vincenza Tarantino, Dr. Sami Schiff

Objectives: The aim of the study was to compare the spectral values of EEG sleep states in preterm infants born at different gestational age who were at the same 35 weeks of post-conceptional age (PCA).

Methods: One-hour monopolar EEG was recorded before discharge in twenty-one NICU admitted premature infants (mean gestational age-GA 30 weeks, range 27–35) during active (AS) and quiet sleep (QS) from electrodes Fp1, Fp2, Fz, T3, T4, C3, Cz, C4, O1 and O2. Fast Fourier transform algorithm was applied for power spectral analysis of the EEG. The existence of changes between sleep states and gestational age in the power of delta, theta, alpha, beta, low gamma and gamma bands was tested.

Results: The results of the spectral measures show a power increase in the low frequency bands (delta and theta) positively correlated with gestational age in active sleep, which can be mainly traced on fronto-central electrodes ($p<.002$). The power in the higher frequency bands remains homogeneous between subjects. No significant differences are found in quiet sleep.

Conclusions: At the same post-conceptional age, differences in brain electrical activity are highlight between premature infants depending on their gestational age and sleep state. The differences are present in the low frequency bands, the most prominent activity in the immature brain of the preterm neonate.

Discussion: Spectral EEG power, an index of local neural synchrony, is considered the strongest indicator of maturation after 36 PCA (Scher et al., 1995). The lack of changes in the higher frequencies is compatible with the assumption that generation of these oscillations typically requires well-formed structural intra-cortical inhibitory circuitry which are not yet mature at this developmental phase (Kostovic and Judas, 2002). Interesting, the detected differences in our study are present only in active sleep, the sleep state in that occurs endogenous neurosensory stimulation, fundamental process for cortical development and cognitive processing (Graven, 2006, Bisiacchi et al 2009). These results may reflect alterations in brain function as a results of conditions leading to extreme premature birth and/or of prolonged adaption to extra-uterine life. These findings show that differences are evident even before term age and points to the importance of early identification of risk factors on brain development.

Publications:

CHIARELLI V, EL YAGOUBI R, MONDINI S, BISIACCHI P, SEMENZA C. (2011)The Syntactic and Semantic Processing of Mass and Count Nouns: An ERP Study**. PLoS One**. 2011; 6(10):e25885. Epub 2011 Oct5

GOLJAHANI A .; D'AVANZO C., SCHIFF S., AMODIO P. ; BISIACCHI P.; SPARACINO G., (in press) A novel method for the determination of the EEG individual alpha frequency, **NEUROIMAGE**

TARANTINO, V., MIONI, G., GRASSI, M., STABLUM, F., BISIACCHI, P.S.(submitted) Duration discrimination threshold of sub- and supra-second stimuli.

TARANTINO, V., CONA, G., BIANCHIN, M., BISIACCHI, P.S. (under revision) Monitoring mechanisms in event- and timebased prospective memory.

TARANTINO, V., EHLIS, A-C., BAEHNE, C.G., A. BOREATTI-HUEMMER, JACOB, C.P., BISIACCHI, P.S., FALLGATTER A.J. (in preparation) Mechanisms of time processing in adult with ADHD: an ERP study.
CONA G., ARCARA G., TARANTINO V., BISIACCHI PS (under revision) Electrophysiological Correlates of Strategic Monitoring in Event-based and Time-based Prospective Memory
SCHIFF S.,D'AVANZO C., CONA G., GOLJAHANI A., MONTAGNESE S., SPARACINO G., AMODIO P, BISIACCHI P (submitted) Insight into the relation between brain/behavioural speed and variability: evidence from minimal hepatic encephalopathy

Proceedings
TARANTINO V, MENTO G I, R VITALIANI R, BISIACCHI P (2011). Electrophysiological correlates of time discrimination in parkinson's disease . In: **PSYCHOPHYSIOLOGY**. BOSTON, USA, SEPT 2011, vol. 48(1), p. S68, MADEN:WILEY-BLACKWELL
ARCARA G, CONA G, TARANTINO V, BISIACCHI P (2011). Neural correlates of prospective memory: a comparison between a time-based and an event-based task. In: P**SYCHOPHYSIOLOGY**. BOSTON, USA, SEPT 2011, vol. 48 (1), p. S75--S76, MALDEN 02148, MA:WILEY-BLACKWELL
SUPPIEJ A, CAINELLI E, CAPPELLARI A, ERMANI M, ZANARDO V, BISIACCHI P (2011). Clinical correlates of cortical auditory evoked potentials in preterm newborns. In: IX EUROPEAN PAEDIATRIC NEUROLOGY SOCIETY CONGRESS. DUBROVNIK, 11-14 MAY

Keyword: Preterm infants, spectral analysis, active sleep, quiet sleep

148/08 - "Design and Testing of a Wearable Device for Neurofeedback of Physiological Correlates to States of Consciousness"

Instituição/*Institution*: Institut für Umweltmedizin und Krankenhaushygiene, Universitätsklinikum Freiburg - Germany
Duração/*Duration*: 2009/04 - 2011/03
Investigador/*Researcher*: Dr. Thilo Hinterberger

Objectives: Conventional neurofeedback usually focuses on the self-regulation of a specific brain parameter which is fed back on a computer screen in order to counter-regulate a symptomatic brain correlate. In contrast the neurofeedback device developed in this project will provide simultaneous feedback of a variety of physiological signal sources such as EEG or ECG. Various subcomponents of a measured signal can be transferred to sounds of specific instruments with the aim to maintain the information content. The user will be able to perceive the inner body processes as a visual and sound experience.

Methods: Two prototypes of a small, wearable feedback device have been developed that allow for real-time data processing, sonification and control of light sources. The first prototype was equipped with 2 analog-to-digital converters for direct read in of pulse and respiration data. A 32 bit microprocessor was used for data processing. Processed data were sent to a MIDI sound chip and to a light controller. The second prototype was equipped with a Bluetooth transceiver that could directly interface a small, wearable EEG amplifier measuring EEG and pulse simultaneously.
The algorithms for sonification have also been implemented in a PC-based program for improved performance reasons. The systems were able to control studio lighting systems and external speakers. Consequently, a whole feedback environment was created that allowed a person to experience the inner processes in the outer world. This feedback environment was termed 'Sensorium'.

Results: In a pilot study, 20 participants (10 experienced meditators and 10 non-meditators) have been exposed in a meditative session to their ongoing brain and heart signals inside the Sensorium. ECG (pulse), slow cortical potentials, and different EEG frequencies were fed back in real-time. All participants were impressed and gave positive feedback. Almost all of them reported an increase in contentment, relaxation, happiness, and inner harmony which was assessed in a questionnaire . They also reported a widening of their body consciousness.

Discussion: This novel neurofeedback-device presents a variety of body signals and rhythms in sound and light to the user providing a unique sensory experience of non-perceptible inner processes leading to various positive states of consciousness.
Conclusions: In future, therapeutic paradigms will be developed and the treatment effects on people with psychological or psychosomatic diseases will be evaluated.

Publications:

Abstracts and conference talks:

T. Hinterberger, "Mind-Body Interaction using Real-Time Sonification of Neurophysiological Signals" 15. Herbstakademie "Embodied Cognition and Embodied Communication", Bern, Switzerland, Oct. 7-9, 2009.
T. Hinterberger, "Neurofeedback, Brain-Computer Communication, and Neurosonification – Approaches and Novel Applications" CalIT Conference in Bad Tölz, Germany, Sept. 2010.

Journal articles:

Hinterberger, T., (2011), "The Sensorium: A Multimodal Neurofeedback Environment", Special Issue on Advances in Human-Computer Interaction, doi:10.1155/2011/724204.

Keywords: Neurofeedback, Consciousness Research, Meditation

149/08 - "A closer look at meditation: Challenging the attentional network on different types of meditative procedures"

Instituição/*Institution*: for Mindfulness, Meditation and Neuroscience Research, Institute of Environmental Health Sciences, University Medical Center Freiburg - Germany

Duração/*Duration*: 2010/04 - 2011/09

Investigadores/*Researchers*: Prof. Stefan Schmidt, Prof. Harald Walach, Dr. Thilo Hinterberger, Dr. Matthias Braeunig, Dr. Jose Raul Naranjo and Dr. Kathrin Simshäuser

Objectives: Meditation can be described as a special way to pay attention on a continuous moment to moment basis. Research has shown that meditation techniques are able to enhance attentional capacities. We took a closer look at this relationship between meditation and attention. Regarding the human attentional network three distinct and different systems of attention (alerting, orienting and executive control) are described. We focused on developing assessment tools for the description of a meditation practice focusing on motivation and attentional focus. Further, we to assess whether meditators practicing predominately mindfulness-based meditation techniques perform better on the orienting-component of the attentional network compared to meditators practicing predominately concentration-based techniques, while the concentration-based group should perform better in the executive control system.

Methods: For assessing attentional strategies a new questionnaire was developed. In order to assess whether we can distinguish between different meditation approaches 24 different meditators performed the Attention Network Test (ANT) assessing the alerting, orienting and executive network simultanously by measuring reaction time and event related potentials (ERP) of the EEG. A matched group of 24 non-meditators served as controls.

Results: Based on the analysis of a sample of more than 500 meditators a 31-item scale with excellent psychometric properties and four distinctive scales could be developed. In the ANT part of the study meditators showed better performance in the executive network ($p=.01$). No correlation could be found between self-report of attention strategy and performance in the ANT. ERP analyses revealed shorter latency to N1 in meditators compared to controls (alerting network). For the executive network the N2 difference in meditators was much smaller than in controls indicating reduced executive processing.

Discussion: We were able to operationalize meditation strategies, context and motivation with three different questionnaires. The ERPs were only indicative on
the executive component of the ANT while there was no difference for the two other networks.

Conclusions: We could conclude that obviously the hypothesized attentional effect could not be uncovered with this type of test. This supports to think more detailed about the specific quality of presence and the associated attentional benefits which are cultivated by meditation.

Publications:

Stefan Schmidt, Thilo Hinterberger, Elisa Inacker, Michael Markowiak, Mathis Trautwein. „Challenging the Attentional Network on Different Types of Meditation", Abstract for poster presentation, International Symposia for Contemplative Studies, Denver, April 2012.

Schmidt, S. & Netz, B. (2011). Why are people meditating? -- the Meditation Motivation Scale. (Abstract). 4th European Conference on Integrated Medicine, Berlin October 7-8th 2011.

Keywords: Meditation, Attention Network, EEG, Event-related Potentials

159/08 - "Developing a “Recipe” for Success in ESP Experimental Research (Phase III): Integrating Psi-conducive Practices"
Instituição/*Institution*: University of Greenwich, Eltham, London - UK
Duração/*Duration*: 2009/01 - 2011/01
Investigador/*Researcher*: Dr. Jose M. Perez Navarro

Aims: The aim of this study was to integrate a series of recommendations, gathered via survey from the research community in a previous piece of work (Pérez-Navarro, 2005), in a free-response protocol and compare its efficacy with the standard Ganzfeld procedure.

Method: We used two experimental conditions: a standard Ganzfeld condition (N=50), and an experimental condition integrating the researchers' recommended practices (N=50). These included, among others, using successful target sets from previous studies, holding a pre-experiment informal chat, providing feedback to the sender, reviewing the individual’s comments after the session, etc.

Results: Participants were more successful in the experimental condition that integrated the researchers' recommendations (15 hits, 30%, z=0.82, p=0.21 vs. 11 hits, 22%, z=-0.49, p=0.31). This difference did not reach statistical significance (z=0.92, p=0.18). Degree of success of the *target stimulus* in previous studies was a strong predictor of the session outcome (rxy=0.39, p=0.004). In a multiple lineal regression analysis *post-session review* contributed to the prediction of performance with a significant coefficient of 0.15 (p=0.006).

Conclusions: Although the results obtained with the integration of the researcher's recommendations in the experimental protocol was in the hypothesised direction, it did not reach statistical significance at alpha=0.01. Therefore, we must be either far from understanding the underlying mechanisms of ESP that would help us to unfold a fully visible version of the phenomenon in the laboratory or, we must be, simply, dealing with a very weak effect.

Discussion: The Ganzfeld has been the result of long efforts towards the development of an experimental protocol to replicate ESP. However, even if we assume that Ganzfeld meta-analyses have proven ESP, there is still a problem of visibility, nowadays the main obstacle in this area in terms of financial support, interdisciplinary co-operation, and effective dissemination and acceptance of findings.

Publications:
Pérez Navarro, J. M. (2012). An Empirical Evaluation of a Set of Recommendations for Extrasensory Perception Experimental Research. *Europe's Journal of Psychology*, Vol. 8, February 2012.

Key-words: Ganzfeld, ESP, parapsychology, perception.

162/08 - "Meditation at the core: neuroscientific comparison of attentional resource allocation in different meditation practices" – only abstract available
Instituição/*Institution*: CERCO, Centre de Recherche Cerveau et Cognition, Toulouse - France
Duração/*Duration*: 2009/02 - 2011/07
Investigadores/*Researchers*: Dr. Arnaud Delorme, Dr. Claire Braboszcz, Dr. Romain Granchamps, Dr. Rael Cahn, Dr. Emmauel Fernandez

Objectives: Despite decades of electro-encephalography (EEG) research on meditators, the basic effects of meditation on EEG are still being defined. One of the reason why no consensus has been reached is that there is a large number of meditation practices. Is it reasonable to assume that all meditation will lead to brain activity that is identical in all traditions? In this current study, we addresses the hypothesis that different types of meditation lead to different neural correlates.

Methods: We compare 3 types of meditations and a group of control meditation-naive participants. Meditation groups included a group practicing focused meditation on body sensations (Vipassana), a group practicing focused meditation on mantra repetition (Hymalayan tradition), a group praciticing open awareness meditation centered on pure awareness (Isha tradition). Each group had 16 gender-matched participants of similar age range. Participants were asked to practice 20 minutes of meditation followed or preceded by 20 minutes of instructed mind wandering where participants were asked to voluntarily remember autobiographical events.

Results: We did not find state effects between the meditation and the instructed mind wandering tasks for any of the groups. However, we observed difference between the groups. Meditators of all traditions tended to show higher gamma activity than control subjects during the meditation period. The effect was significant for Isha and Hymalayan meditators and a trend was observed for Vipassana meditators. This gamma activity was independent of muscle activity as isolated using the independent component analysis algorithm. In addition, we observed higher alpha activity for the Vipassana group during meditation compared to all other groups.

Conclusions: We have shown that regular meditation practice evokes traits changes in the electrical oscillations of the brain, that can be different from one meditation technique to another. Our results emphasize the need to include meditation-naive control participants and groups of different meditation traditions following the same experimental protocol for studies aiming at characterizing the neural correlates of the meditative state.

Discussion: Our results are consistent with previous studies. Higher gamma power was observed in Vipasanna meditators and tibetan meditators compared to control subjects.
Publications: Our results will be published in Frontier of Neuroscience special issue on Neural Effects of Mindfulness/Contemplative Training. Our paper has been invited by the editor of this special issue in 2011. The article will be published in 2012.

Key-words: Meditation, EEG, gamma

169/08 - "When Rejection Hurts: Probing the Neural Basis of Childhood Social Exclusion with a Dense-array EEG"
Instituição/*Institution*: Yale Child Study Center, New Haven - USA
Duração/*Duration*: 2009/02 - 2011/09
Investigadores/*Researchers*: Dr. Michael J. Crowley, Prof. Linda C. Mayes, Dr. Christopher A. Bailey

Objectives: Across two studies we explored the neural correlates of social exclusion during a ball toss game between a child and two hypothetical peers and when social exclusion involved a childhood friend.

Methods: Event-related potentials (ERPs) were assessed during a computer-simulated ball-toss game, Cyberball. This game simulated equal throws among players “fair play” and then a social exclusion experience, when the child subject was left out of the game. This occurred between a child 8-12 yrs. and two fictitious peers (Study 1), or between a child subject, a close childhood friend and a fictitious peer (Study 2). Hurt feelings were assessed with an ostracism distress measure in both studies. Study 2 also incorporated a new scale, the Friendship Distress Questionnaire (FDQ).

Results: In Study 1, ERPs revealed that rejection events are perceived rapidly, evident in a posterior ERP peaking at 420 ms, consistent with a larger P3 effect for rejection events. Condition differences for rejection versus “not my turn” events were evident for slow-wave activity (500-900 ms) in the medial frontal cortical region. Distress from the rejection experience predicted a more negative frontal slow wave. Source modeling suggested that slow wave neural activity for rejection events originated from subgenual cortex, ventral anterior cingulate cortex and insula. Study 2 revealed that the traditional ostracism measure did not predict neural response among children who were best friends. Instead distress assessed by the FDQ predicted a frontal slow wave neural response among children who were excluded by their best friend.

Conclusions: The detection of a social exclusion event appears in less than ½ second. Cortical slow wave activity predicts degree of felt exclusion. When exclusion emerges from a friendship, themes assessed such as breach of trust and unfairness predicted cortical slow wave activity, whereas global distress did not. This outcome suggests that different processes may be engaged when social exclusion involves a close friend.

Publications:
Crowley, M. J., Wu, J., McCarty, E. R., David, D. H., Bailey, C. A., & Mayes, L. C. (2009). Exclusion and micro-rejection: event-related potential response predicts mitigated distress. NeuroReport, 20(17), 1518-1522.
Crowley, M. J., Wu, J., Molfese, P. J., & Mayes, L. C. (2010). Social exclusion in middle childhood: rejection events, slow-wave neural activity, and ostracism distress. Social Neuroscience, 5(5-6), 483-495.
White, L. O., Wu, J., Borelli, J. L., Rutherford, H. J. V., David, D. H., Kim-Cohen, J., Mayes, L.C. & Crowley, M.J. (2012). Attachment dismissal predicts frontal slow-wave ERPs during rejection by unfamiliar peers. Emotion.

Key words: Event-related potentials, social exclusion, children.

176/08 - "How do we choose a partner? Neural circuits involved in inbreeding avoidance and mate selection"
Instituição/*Institution*: Instituto Gulbenkian de Ciência, Oeiras - Portugal
Duração/*Duration*: 2009/02 - 2011/03
Investigadores/*Researchers*: Dr. Susana Sá Couto Quelhas Lima, Dr. Léa Zinck

Objectives: Mate choice is a key driving force of evolution but the proximate mechanisms allowing mate assessment by the nervous system are still unknown. Our main goal is to understand how mate value is represented in the female brain.

Methods: In order to understand how mate value and preferences are represented in the brain, we have established a behavioral paradigm where the subjective value of prospective mates can be manipulated. Our behavioral paradigm takes advantage of a natural situation occurring in Europe where two subspecies of mouse, *Mus musculus musculus* and *M. m. domesticus,* form a narrow hybrid zone, and show asymmetric mate choice. By using inbred strains of wild-derived and laboratory mice we were able to translate this situation into laboratory conditions and to control female preference in a reproducible way. We investigated mate preference behavior of *musculus* females for *musculus versus domesticus* males in two different paradigms, which either allowed females to actually mate or only to smell the males through perforated partitions (limited contact paradigm) preventing the male's behavior to have an influence on female's choice.

Results: In both cases, *musculus* females exhibited a strong homosubspecific preference, as the one found in nature, which was revealed by the number of mounts and ejaculations they received from *musculus* / *domesticus* males (in the full contact paradigm) and by the relative time spent by females near the males (in both paradigms). However if *musculus* females are fostered in a domesticus environment at birth, this homosubspecific preference is disrupted in the adulthood, suggesting that early experience plays a critical role in setting individual mate preference in mice.

Discussion: This result suggests that imprinting may be one of the mechanisms by which assortative mating is generated, and reproductive isolation maintained, at the *musculus* / *domesticus* hybrid zone. While similar phenomena have been documented in fish and birds this is the first time, to our knowledge, that imprinting is shown to be involved in setting conspecific mate preferences in a mammalian species. As females reared in a musculus or a domesticus environment show different mate preferences, we can now compare the neuronal representation of the same stimulus male which has a different value in these two types of females. We are currently taking the first steps to explore which brain regions might underlie this behavioral preference.

Keywords : Mate choice, behavior, imprinting, mouse.

183/08 - "Communication in shared altered states using the hypnotic and Ganzfeld induction of lucid dreams"

Instituição/*Institution*: University of Gothenburg, Psychology Department: Consciousness Studies Unit - Sweden

Duração prevista/*Estimated duration*: 2009/03 - 2012/03

Investigadores/*Researchers*: Prof. Adrian Parker, Dr. Annekatrin Puhle, Dr. Amanda Sondefors, Dr. Andreas Lantz, Dr. Timo Paulson

Objectives: The project had its starting point in the paper in Science 1976, on State Specific Sciences by Charles Tart and the work on shared dreams by Robert Waggoner. Its objective is to document the frequency of lucid and shared dreams and to find ways of producing potentially shared states of consciousness in the laboratory.

Method 1: involved surveys of the student population to establish the frequency of the lucid and shared dreams and select suitable participants.

Results: The major survey found that about 80% of students reported experiencing a least one lucid dream with 24% of them reporting one or more per a month. The frequent lucid dreamers were more likely to report more content and communication with dream figures. Shared or mutual dreams were reported by 13% of the respondents and occurred most often amongst those having one or more lucid dreams per month. A survey of students sleep habits indicated that so-called “power naps” are used purposively by 60% of students with 21% of students using them regularly.

Method 2: The use of a special form of stroboscopic stimulation has been reported by Winkler and Proecki to facilitate the occurrence of lucid dream-like states. Volunteers reporting lucid dreams and related experiences, were located in separate laboratory and each was given an half hour of stroboscopic stimulation. A randomly selected melody was played to one of the participants during each session. The task was for the other participant was able to successively identify it from a sample of 4 control decoys.

Results: were exactly at chance expectancy. All the hits came from the sessions in which one of the experimenters was a participant.

Method 3: A further study is being carried out along similar lines but with participants having power naps in the laboratory using a REM dream monitor. Participants are selected adepts with frequent lucid dream and dream recall.

Results: are pending.

Conclusions: None of the techniques seem to work with a wide range of participants although a modification of the ganzfeld using auditory feedback from the lucid dreams of the receiver, remains as yet untested. We need to work with highly selected individuals and given their frequency in the population, this is feasible.

Keywords: lucid dreams, shared dreams, mutual dreams.

200/08 - "The Effect of Paranormal Belief and Cognitive-Perceptual Factors on Mnemonic Performance: An Experimental Investigation"

Instituição/*Institution*: The Manchester Metropolitan University (MMU), Research Institute of Health and Social Change, Faculty of Health, Social Care & Education, Division of Psychology and Social Change, Manchester - UK

Duração/*Duration*: 2009/08 - 2011/09

Investigadores/*Researchers*: Dr. Neil Andrew Dagnall, Dr. Andrew Parker, Dr. Gary Munley

Objectives: The project addressed two fundamental questions. First, whether high scores on paranormal belief were associated with disrupted true memory and susceptibility to false memories. Second, whether any 'observed' memory effects could be explained by cognitive-perceptual factors associated with paranormal belief (i.e., schizotypy, transliminality, and delusional ideation).

Methods: Two established experimental techniques were used: the Deese-Roediger-McDermott (DRM; Deese, 1959; Roediger & McDermott, 1995) and the misinformation paradigm (e.g., Loftus, Miller & Burns, 1978).

Results: Phase I (DRM paradigm) found that participants scoring above (vs. below) the median for belief in the paranormal and delusional ideation produced higher numbers of false memories for critical lures (associative false memory). Level of paranormal belief and level of cognitive-perceptual factor had no effect upon true memory (presented items), or other measures of false memory (non presented list items & non presented critical lures). Overall, paranormal belief and cognitive-perceptual factor scores were not predictors of mnemonic performance (true & false memory). In addition to this, neither level of paranormal belief, nor level of cognitive-perceptual factor had a consistent effect on the quality of memories as measured by the remember-know procedure.

Phase II (misinformation effect) found that only level of paranormal belief affected mnemonic performance. Participants in the upper quartile scored higher on true memory and recognised more misinformation items (false memory) than participants in the lower quartile. The cognitive-perceptual measures had no effect on memory. Whilst, positive correlations were observed between signal detection measures of memory (true d', false d', & unrelated information) these measures failed to correlate with either paranormal belief, or the cognitive-perceptual measures. Finally, level of paranormal belief and level of cognitive-perceptual factor had no effect on remember-know responses.

Conclusions: Level of paranormal belief and scores on associated cognitive-perceptual factors were not found to reliably predict mnemonic performance.

Discussion: Further research is required if the relationship between paranormal belief and mnemonic performance is to be fully understood.

Publications: Findings are currently being disseminated via conference and are in preparation for journal submission.

Keywords: Paranormal belief; cognitive-perceptual; memory.

201/08 - "Posterior Parietal Cortex Involvement in Skill Learning"
Instituição/*Institution*: Laboratory of Neurobiology of Human Behavior of Hospital de Santo António, Porto – Portugal - and Division of Behavioral Neurology and College of Medicine of the University of Iowa, Carver College of Medicine - USA
Duração prevista/*Estimated duration*: 2010/02 - 2012/03
Investigadores/*Researchers*: Prof. Sara Marta Pereira dos Santos Cavaco, Prof. Steven Wayne Anderson, Dr. Pedro Soares Pinto, Dr. Ricardo Taipa

Objective: The main goal of the study was to use the human lesion method approach to explore the putative association between posterior parietal cortex and skill learning.

Methods: 16 subjects with chronic unilateral damage to the posterior parietal cortex (PPC) and 33 subjects with chronic unilateral damage to other cortical areas not involving the parietal cortex (OCA) with comparable demographic characteristics were drawn from the Patient Registry of the Division of Behavioral Neurology and Cognitive Neuroscience at the University of Iowa Carver College of Medicine. Posterior parietal cortex was defined as parietal cortex posterior to the post-central sulcus. Patients with multiple lesions or with damage to the cerebellum or the basal ganglia were not included. All PPC and OCA participants underwent thorough neurological, neuroimaging, and behavioral examinations. Behavioral data were also collected from 30 healthy demographically comparable subjects recruited in the community (HC group). The behavioral assessment included three skill learning paradigms (i.e., Mirror Reading, Mirror Tracing, and Rotary Pursuit).

Results: The PPC group had significantly ($p<.05$) poorer baseline performance than the other groups on the mirror reading task. A similar trend ($p<.1$) was found regarding the mirror tracing task. The baseline performances on the rotary pursuit were not statistically different between groups. However, PPC participants showed reduced improvement with practice on the rotary pursuit task ($p<.05$), but not on the mirror reading and mirror tracing tasks. No clear associations were found with lesion side.

Conclusions: The preliminary results suggest that the contribution of the posterior parietal cortex to skill learning varies with stage of practice and with task requirements. In the initial stages of practice, this cortical area appears to be particularly involved in tasks that require visuo-spatial transformations (e.g., mirror reading and mirror tracing), but its contribution to the early performance of visuomotor tracking tasks (e.g., rotary pursuit) does not seem to be critical. However, the opposite associations were found after extended practice (i.e., damage to posterior parietal cortex was related to impaired learning of visuomotor tracking skills, but not with impaired learning of perceptual and perceptual-motor adaptation skills).
Discussion: Prior to this research project, no human lesion study had systematically analysed the putative involvement of the posterior parietal cortex in learning different perceptual and perceptual-motor skills. The reported results corroborate and extend findings from functional neuroimaging studies.

Publications: The study results have not been published yet.

Keywords: memory, skill learning, parietal cortex, lesion method

2010

27/10 – "From Trance to Transcendence during Meditation"
Instituição/*Institution*: The Leslie and Susan Golda (Goldschmied) Multidisciplinary Brain Research Center, Bar-Ilan University, Ramat Gan - Israel
Duração prevista/*Estimated duration*: 2011/06 - 2012/07
Investigadores/*Researchers*: Prof. Joseph Glicksohn, Dr. Abraham Goldstein, Dr. Aviva Berkovich Ohana

Background: Advanced practitioners of mindfulness meditation become aware of transcendent experiences during the session, and can indicate that they are reflectively aware of a change in consciousness. Our preliminary data indicated the transition from trance to transcendence within meditation using EEG. A topographic snapshot of the EEG extracted between 5 and 10 minutes after the start of the meditation session (with eyes closed), for one advanced practitioner exhibits clear dominance of alpha activity both parietally—with L > R asymmetry—but also frontally—and especially mid-frontally. A second topographic snapshot extracted immediately prior to his signal indicating his change in reflective awareness exhibits a marked shift in parietal alpha asymmetry (R > L) and a greater amount of midfrontal alpha. An increase in theta power frontally was also found (Glicksohn & Berkovich Ohana, 2011).

Objectives: (1) to have a select group of 8 experienced MM practitioners return for MEG measurement; (2) to conduct a detailed investigation of the transition from trance to transcendence, aided by the participant's signal of a change in reflective awareness, and follow-up in-depth interview of these experiences.

Methods: MEG recordings are conducted with a whole-head, 248-channel magnetometer array in a magnetically shielded room. Our participants have complete EEG data from their previous session in our lab (Berkovich-Ohana, Glicksohn, & Goldstein, in press). We consider changes in the awareness of time, space or self as being indicative of the type of experience that we are particularly interested in when charting experiences of both trance and transcendence within meditation. Each such experience is investigated both by deliberate instruction and as appearing (if appearing) spontaneously. Each such dimension is also investigated using either a task or a questionnaire.

Results: Preliminary results will be presented at the symposium (the study is being run at the present).
Publications:
Berkovich-Ohana, A., Glicksohn, J., & Goldstein, A. (in press). Mindfulness-induced changes in resting state activity–implications for the default mode network, self-reference and attention. *Clinical Neurophysiology*.
Glicksohn, J., & Berkovich Ohana, A. (2011). From trance to transcendence: A neurocognitive approach. *The Journal of Mind and Behavior, 32*, 49-62.

Keywords: states of consciousness, meditation, trance, transcendence, alpha, theta

40/10 – "Psychophysiological investigations of interference resolution during memory retrieval" – only abstract available

Instituição/*Institution*: Cardiff University Brain Research Imaging Centre (CUBRIC), School of Psychology, Cardiff - UK
Duração prevista/*Estimated duration*: 2011/05 - 2012/04
Investigadores/*Researchers*: Prof. Edward Wilding, Dr. Damian Cruse

Objectives: This experiment was designed to investigate changes in neural activity during a retrieval task, assuming that the demands placed on monitoring the contents of retrieval increase as the numbers of stimuli to which memory judgments are required also increase.

Methods: We measured event-related potentials (ERPs) because they index processes related to retrieval monitoring. Participants first studied words in one of two colours. Studied and unstudied (new) words were then presented in a neutral colour. ERPs were acquired while people made old/new and then study colour judgments to the words.

Results: ERPs associated with correct judgments to new words (correct rejections) and correct colour judgments to old words were compared for the first and the second halves of the retrieval task. The differences between these two classes of ERPs were not the same over the task from 1000ms post-stimulus. Response accuracy did not vary, and reaction times were slower in the second half.

Conclusions: These ERP differences occurred in a time period where ERPs have been shown to index retrieval monitoring operations. The findings indicate, therefore, that not entirely the same retrieval processes were engaged over the complete retrieval task. Alongside the absence of evidence for this change in an experiment where auditory rather than visual contexts were used at study, these findings suggest the outcome is not simply an effect of time on task. It is possible that the changes across halves index additional processes engaged as the demands placed on distinguishing between similar memory representations increase. Irrespective of the accuracy of this account, however, these findings indicate there are circumstances where making functional inferences about patterns of neural activity in brain imaging experiments based on data averaged over the entirety of retrieval tasks can lead to inaccurate functional characterisations.

Keywords: Retrieval Monitoring; Episodic Memory; Event-related potentials.

45/10 – "Shamanic-Like Journeying and Psi-Hitting: Searching for the Psi-Conducive Component(s) of a Novel Experimental Protocol"
Instituição/*Institution*: Phoenix Institute of Victoria, Prahran - Australia
Duração prevista/*Estimated duration*: 2011/04 - 2012/03
Investigadores/*Researchers*:Dr. Adam Rock

Storm and Rock (2009a) developed an imagery cultivation (IC) model which regards shamanic techniques and, similarly, shamanic-like techniques, as being psi-conducive. In a recent experimental study, Storm and Rock (2009b) obtained preliminary empirical support for the IC model.

Objectives: The aim of the present study was to determine which component/s of the shamanic-like journeying stimulus used by Storm and Rock (2009b) is/are psi-conducive. Since psi-modifying variables should also be investigated in psi research, paranormal belief/experience (as measured on Thalbourne's, 1995, Australian Sheep-Goat Scale), Transliminality (the tendency for psychological material to cross into or out of consciousness; see Thalbourne & Houran, 2000), and Self-Expansiveness (as measured on Friedman's, 1983, Self-Expansiveness Level Form) were tested in the present study as possible predictors of psi.

Design and Procedure: Two hundred non-shamans were randomly assigned to one of four conditions: (1) instructions with drumming; (2) instructions without drumming; (3) no instructions with drumming; and (4) no instructions and no drumming (control condition). After the stimulus condition, participants were required to describe verbally, and then rank a randomly-selected concealed line-drawing, which they held throughout the condition.

Results: Hit rates were above chance in the instruction + drumming condition and instruction condition only (not significantly). Self-expansiveness predicted hit-rates.

Conclusions: This study provides tentative support for the IC model, which suggests that drumming without imagery cultivation instructions will be associated with hit rates at chance.
Discussion: This study highlights the importance of the self-expansiveness construct in the context of shamanic-like journeying and psi-hitting.

Publications: Two papers will be submitted for consideration to the *Journal of Parapsychology*.

Keywords: imagery cultivation, psi, shamanism

57/10 – "Psychophysiological, behavioural and experiential responses to evoked positive and negative emotion in people with eating disorders" – only abstract available
Instituição/*Institution*: King's College London, Institute of Psychiatry, London - UK
Duração prevista/*Estimated duration*: 2011/03 - 2012/03
Investigadores/*Researchers*: Dr. Kate Tchanturia, Dr. Helen Davies

Objective: Recent models of eating disorders (ED) have emphasised the importance of emotional avoidance and dysregulation in the maintenance of the disorders, however empirical data are limited. The objective of this study was to investigate behavioural, cognitive and psychophysiological aspects of emotional responding in EDs.

Methods: An amusing and a sad film clip were used to evoke emotion whilst facial expressiveness, subjective experience and skin conductance (SC) were recorded in 20 women with anorexia nervosa (AN), 14 with bulimia nervosa (BN) and 26 healthy control (HC) women.

Results: In response to the amusing film clip AN participants reported and expressed less positive emotion than BN and HC participants, however there was no difference in groups on SC reactivity. In response to the sad film clip, all three groups reported experiencing similar levels of negative emotion. AN participants were less facially expressive than BN and HC, and BN participants showed increased SC reactivity compared to HC and individuals with AN. Although the AN group demonstrated more impairments in their emotion responses, discrepancies between emotion components characterised both ED groups in response to sad stimuli.

Conclusion: Using a comprehensive experimental measurement of the emotion response system our findings highlight differences in emotion responses between people with anorexia and bulima nervosa and in response to positive and negative stimuli. Inhibited negative emotion expression could play a role in increasing arousal and negative affect.

Keywords: eating disorders, emotion, expression, psychophysiology

82/10 – "An investigation into the prevalence and phenomenology of synchronicity experiences in the clinical setting"

Instituição/*Institution*: Centre for the Study of Anomalous Psychological Processes (CSAPP), The University of Northampton - UK
Duração prevista/*Estimated duration*: 2011/03 - 2012/04
Investigador/*Researcher*: Dr. Elizabeth Roxburgh

Objectives: The purpose of this research was twofold. Firstly, to investigate how common synchronicity experiences are in the clinical setting and whether there are there any differences between clinicians in the reporting, interpretation or explanation of synchronicity experiences. Secondly, to explore the phenomenology of synchronicity experiences, focusing on how clinicians make sense of these experiences.

Methods: The research used a mixed-methods design. The first stage of the research involved a nationwide on-line survey which was completed by a representative sample of clinicians. The second stage involved a qualitative study using interpretative phenomenological analysis (IPA; Smith, 1996). Semi-structured interviews were conducted with a sample of counsellors, psychologists and psychotherapists who reported synchronicity experiences in their therapeutic sessions.

Results: Preliminary analysis of the closed items from the survey suggests that clinicians are more likely to have experienced a synchronicity event if they are female, if they practise as a psychotherapist and have been working within their profession for ten years or more. Additionally, psychologists are more likely to report that synchronicities are chance coincidences that individuals ascribe meaning to, whereas psychotherapists tend to report that synchronicities occur because the client needs to discuss important unconscious material. A thematic content analysis on the open ended data is in progress and a more sophisticated quantitative analysis will be conducted on the closed item data once the survey has closed. Themes from the IPA study will be reported at the conference alongside participant extracts to illuminate how they are grounded in the data.

Conclusion/Discussion: An overwhelming outcome of the research is that synchronicity experiences are seen as a useful tool for therapy. Therefore, on a therapeutic level, it is necessary to explore what implications any reported synchronicity experiences have on the therapeutic relationship and clinical outcome of the client. Findings may support a more integrative approach to therapy that acknowledges anomalous experiences, such as synchronicity events, as subjectively real for the client. On a parapsychological level findings might shed some light on whether ESP is involved in synchronicity. If so, it would be an example of how psi might operate in a real world setting.

Publications: Smith, J. A. (1996). Beyond the divide between cognition and iscourse: Using interpretative phenomenological analysis in health psychology. *sychology and Health, 11*(2), 261-271.
d*P*

Keywords: Interpretative phenomenological analysis, synchronicity/meaningful coincidence, clinical setting/psychotherapy, on-line survey, semi-structured in-depth interviews.

139/10 – "Mobile Consciousness: Developing a Smartphone Application for REG Exploration and Distributed Consciousness Research"

Instituição/*Institution*: International Consciousness Research Laboratories, New Jersey - USA
Duração prevista/*Estimated duration*: 2011/03 - 2012/03
Investigadores/*Researchers*: Prof. Robert G. Jahn, Adam M. Curry, Hale Brownlee, Dr. Brenda J. Dunne

Objectives: This project involved the development of a "smartphone" application package and back-end data collection network resulting in a low-cost random event generator (REG) system for the mobile phone. The application would provide data for a preliminary investigation into mind-matter effects using existing mobile devices, while providing individuals with personal experiences and insight into the role of consciousness in the physical world.1

Methods & Results: An investigation of a method to generate true-random numbers from the internal hardware of a smartphone device resulted in a successful technique to convert processes within an Apple iPhone's accelerometer into random binary numbers which passed statistical tests of randomness. An intuitive graphical interface was developed for the iPhone to generate, utilize, and transmit data. Server-side algorithms were implemented to collect, database, and analyze transmitted data.

Conclusions & Discussion: The effort has established both the viability and the core technology behind what could be a new generation of research techniques into consciousness-correlated physical phenomena. The establishment of a large-volume distributed REG network would have the potential to reveal correlations among individual, regional, and global consciousness effects.2 The wide availability of smartphones offers new possibilities in mobile computing that can extend this research to a much larger community of users, while eliminating many of the costs and complexities associated with strictly hardware-based methods of the same.

Publications:
Jahn, R.G. and Dunne, B.J. Consciousness, Information, and Living Systems (2005). *Cellular & Molecular Biology*, 51: 703-714.
Nelson, R. and Bancel, P. Effects of Mass Consciousness: Changes in Random Data During Global Events (2011). *Explore*, 7: 373-38.

Keywords: Consciousness, Random Event Generator, SmartPhone, ICRL, PEAR Laboratory

142/10 – "Towards a Replicable Formula for Significant Intuitive Ability in an Applied Setting" – only abstract available
Instituição/*Institution*: Integrated Knowledge Systems, Illinois - USA
Duração prevista/*Estimated duration*: 2011/03 - 2012/03
Investigadores/*Researchers*: Dr. James Houran, Dr. Rense Lange

Objectives: Past studies of *intuition* (information processing without conscious reasoning) have often confused this construct with *psi* (paranormal cognition). Thus, experimental and computer-based studies tend to be limited in their ability to assess and quantify several competing origins for intuitive perceptions. We aimed to test whether intuitive thinking is an unusual form of well-defined cognitive processes or whether psi could be a contributing variable to transliminal and reasoning processes as suggested by previous research.

Methods: A convenience sample of hospitality executives (*N* = 50) responded both "intuitively" (spontaneous) and "cognitively" (reasoned) to a set of narratives via a computerized task (Houran, Lange & Lange, submitted) that presented hypothetical situations that were conducive to intuitive thinking. Also embedded in the computerized task was a test of psi, thereby allowing correlations between psi targets and the two sets of responses. Covariates were Sex and scores on Transliminality and Paranormal Belief (New Age Philosophy and Traditional Paranormal Beliefs).

Results: Results indicated that intuitive responses were related as predicted to Transliminality and Paranormal Belief. Further, and most importantly, intuitive responses could not be entirely explained in terms of a conventional "weighting" cognitive process inherent to many other contexts of decision making.

Conclusions: The preliminary results are consistent with the hypothesis that intuitive thinking is a form of unconscious information processing and this process may – at times at least -- utilize sources of information that derive from either cognitive weighting or arguably a psi component.

Discussion: Rather than being synonymous with psi, intuition seems best explained as an experienced-based phenomenon that is improved by thin mental boundaries (high transliminality) and perhaps a need for personal control. For those with this latter profile, psi may be an additional source of information to be used in forming a final "gut decision."

Publications: Houran, J., Lange, R., & Lange, X. (submitted). Applying the Theory of Reasoned Action to a computerized test of intuition. *Journal of the Society for Psychical Research*.

Keywords: transliminality, intuition, decision-making, psi, Theory of Reasoned Action.

196/10 – "Emotional Responses in Patients with Disconnection of the Left and Right Brain Hemispheres"

Instituição/*Institution*: Caltech Emotion and Social Cognition Laboratory, California Institute of Technology, California - USA

Duração/*Duration*: 2011/04 - 2012/02

Investigadores/*Researchers*: Dr. Lynn Kerlin Paul, Prof. Ralph Adolphs, Remya Nair

Objectives: Social interaction is one of the most complex activities processed by the human brain. It requires complex interactions between many different cognitive systems, therefore the connections between these brain regions are likely to play a very important role in social competence. We examined brain connectivity in social cognition by studying eye-movements, social judgments, and psychophysiology in people born without the fibers connecting the left and right cerebral hemispheres, a condition called agenesis of the corpus callosum (AgCC).

Methods: Participants were 15 adults with complete AgCC (9 males, aged 16 - 52) and 10 healthy controls (all males, aged 19 - 48). Groups were matched on age ($t = .22$, $p = .82$). The control group had significantly higher FSIQ scores than the AgCC group ($t = 2.77$, $p = .01$).
We recorded visual attention and physiological arousal as participants viewed 34 social and non-social images. Based on normative data, 17 slides were identified as "negative" and 17 as "neutral". 11 of 17 negative slides and 6 of 17 neutral slides contained people. Participants rated images on Valence (9-point scale from negative=1 to positive=9) and Arousal (from calm=1 to exciting=9).

Results: Group differences on ratings depended on slide type. On negative images, the AgCC group gave lower arousal ratings ($t=2.74$, $p < .05$), but did not differ from controls on valence ratings. In contrast with neutral images, the groups did not differ on arousal ratings, but the AgCC group gave significantly more positive valence ratings than controls ($t = 2.44$, $p < .05$). Groups did not differ in number of fixations to negative images, but the AgCC group exhibited a trend toward significantly fewer fixations than controls on neutral images ($t = 1.73$, $p = .10$).
With respect to people in the images, there were no group differences on rating of unpeopled slides and no difference on valence ratings of peopled slides. However relative to controls, the AgCC group gave lower arousal ratings on peopled slides ($t = 1.34$, $p = .028$), primarily due to lower arousal ratings on negative slides with people.

Conclusions: Despite intact visual attention to both social and nonsocial scenes, adults with AgCC appear to under-appreciate the intensity of negative emotions in people they observe. This may contribute to a positive-interpretation-bias in neutral situations. This study suggests that intact corpus callosum development is critical to development of social skills.

Keywords: Corpus Callosum, interhemispheric, laterality, emotion.