

Culture and the plasticity of perception

Published online by Cambridge University Press: 28 May 2020

Michael Lifshitz (/core/search?

filters%5BauthorTerms%5D=Michael%20Lifshitz&eventCode=SE-AU)

T. M. Luhrmann (/core/search?filters%5BauthorTerms%5D=T.%20M.%20Luhrmann&eventCode=SE-AU)

(https://orcid.org/0000-0002-

7051-4248)

and

Commentary

Related commentaries

Metrics

Article contents



Share Rights & Permissions

(https://s100.copyright.com/AppDispatchServlet?

%202020&author=Michael%20Lifshitz%2C%20T.%20M.%20Luhrmann©right=Copyright%20%20%20The%20Author(s)%2C%202020.%20Published%20by%20Cambridge%20

Abstract

Culture shapes our basic sensory experience of the world. This is particularly striking in the study of religion and psychosis, where we and others have shown that cultural context determines both the structure and content of hallucination-like events. The cultural shaping of hallucinations may provide a rich case-study for linking cultural learning with emerging prediction-based models of perception.

Type

Open Peer Commentary

Information

[Behavioral and Brain Sciences \(/core/journals/behavioral-and-brain-sciences\)](#), [Volume 43 \(/core/journals/behavioral-and-brain-sciences/volume/8060519E47BB25D2D960472E533C856C\)](#), 2020, e107

DOI: <https://doi.org/10.1017/S0140525X19002887> (<https://doi.org/10.1017/S0140525X19002887>)



Copyright

Copyright © The Author(s), 2020. Published by Cambridge University Press

One of the welcome consequences of the thinking through other minds model is that it supports a particular definition of culture: that culture is about patterns that people infer from the behavior of other people, and which in turn motivate their own behavior. The American anthropologists Alfred Kroeber and Clyde Kluckhohn (1952), the great shaggy lions of their day, settled on that definition in the early 1950s after considering hundreds of others.

In the ensuing decades, anthropologists roundly rejected this definition. It seemed too mental. Geertz (1973) was in part responsible. He insisted that culture happened between people, not in their heads. Then came poststructuralism and postmodernism, and anything that spoke of implicit rules seemed to imply too much explicit human intention.

This target article by Veissière et al. reminds us that if we are to give an account of culture that is consonant with a model from neuroscience, we must return to persons who draw inferences about the social world around them and who then act based upon

those inferences. At the same time, its model should reassure anthropologists because the embodied cognition account does not depend on explicit intention.

The further promise of this model lies in its potential to bridge levels of explanation that are usually isolated: from the cultural through the psychological to the neuronal. The free-energy framework may help to investigate how large-scale cultural models shape private experience and behavior. However, whereas Veissière et al. focus on the transmission of cultural norms and knowledge via regimes of attention, they do little to unpack how their model might explain the power of culture over perception *per se*. Indeed, cultural context shapes not only human behavior and attention, but also our most basic subjective experience of sensory perception.

Our own work studying hallucination-like experiences demonstrates the impact of culture on the senses. In the domain of religion, for example, we have found that Charismatic Christians who pray to God with the expectation that God will talk back sometimes report that they occasionally hear the voice of God responding in a way that feels audible (Luhmann 2012). There are individual differences: not everyone hears the voice of God, and those with a capacity for imaginative and sensory absorption seem particularly prone to such sensory overrides (Lifshitz et al. 2019). Training in prayer also seems to play an important role (Luhmann & Morgain 2012). Still, it is a striking observation that holding (and practicing) a cultural model which says that God can (and should) talk back often leads people to experience directly that God is speaking with a hearing quality.

At times, specific cultural events may lead groups of people to report hallucination-like events. In the days following the death of Menachem Schneerson – a Hasidic Rabbi given messianic status – many of his followers reported seeing brief glimpses of him partaking in the activities of daily life (Bilu 2013). Clearly, a strong cultural expectation was at play: that the messiah does not die as normal people do and so may linger visibly on the earthly plane. The enduring puzzle is to link this top-down cultural expectation with the brain's prediction of incoming visual information to explain how these believers came to report that they had, in fact, seen their beloved Rebbe with their own open eyes.

In the study of psychosis, cultural context impacts not only the distress and prognosis of the illness (as pointed out by Veissière et al.), but also the structure and content of the auditory-verbal hallucinations themselves (Larøi et al. 2014). In a recent series of phenomenological interviews, one of us (TML) observed that in Chennai, psychotic patients often experienced the voices of kin; in Accra, patients frequently identified their voices as God; in California, people more often described voices as violent, and emanating neither from God nor from people they knew (Luhmann et al. 2015). This is a complex story. Biological affordance, genetic predisposition, life experience, and cultural invitation all seem to interact to shape the experience of hallucination-like events (Luhmann et al. 2019).

Hallucinations may provide a particularly pertinent domain for fleshing out the implications of the thinking through other minds model. Recently, research has begun to outline a mechanistic predictive coding account of hallucinations, which relates hallucination-proneness to an over-weighting of top-down priors in response to ambiguity in the lower levels of sensory prediction (Corlett et al. 2018). If scientific evidence continues to support the strong-priors theory of hallucinations, this may open an exciting opportunity to link this low-level sensory/neurobiological explanation to the higher-order model of cultural transmission proposed by Veissière and colleagues. We may then have the beginnings of a cross-level account, scaffolded by the free-energy framework, of how culture comes to shape the senses.

It is interesting to note in the context of thinking through other minds that hallucination-like events are often social in nature (Wilkinson & Bell 2016). We hear someone speak, we see those who have passed away, we feel the touch of spirits and angels. Perhaps, such invisible beings may count among the relevant “others” that humans “think through” in transmitting culture. What we take God to think and do might very well sway how we come to think and behave ourselves. In this way, gods and spirits become some of those other minds through which we think.

This then raises the deep puzzle of why certain hallucination-like events acquire authority whereas others do not. When the authority is granted, of course the event becomes powerful because it then carries with it the authority of God, perhaps the ultimate bearer of epistemic prestige. But, why did Joan of Arc's voices compel King Charles VII to give her an army? Or – to frame the question in the most controversial way – why did Jesus's experience of God's voice lead others to follow him as divine, whereas the experiences of so many other would-be prophets did not? That is a complex story of historical uncertainty, but also of charisma, madness and perhaps of things that pass all human understanding.

References

Bilu, Y. (2013) We want to see our king: Apparitions in Messianic Habad. *Ethos* 41:98-126. [CrossRef \(http://dx.doi.org/10.1111/etho.12004\)](http://dx.doi.org/10.1111/etho.12004). [Google Scholar \(https://scholar.google.com/scholar_lookup?title=We+want+to+see+our+king%3A+Apparitions+in+Messianic+Habad&author=Bilu+Y&publication+year=2013&journal=Ethos&volume=41&doi=10.1111%2Fetho.12004&pages=98-126\)](https://scholar.google.com/scholar_lookup?title=We+want+to+see+our+king%3A+Apparitions+in+Messianic+Habad&author=Bilu+Y&publication+year=2013&journal=Ethos&volume=41&doi=10.1111%2Fetho.12004&pages=98-126)

Corlett, P. R., Horga, G., Fletcher, P. C., Alderson-Day, B., Schmack, K. & Powers, A. R. III (2018) Hallucinations and strong priors. *Trends in Cognitive Sciences* 23(2):114-27. [CrossRef \(http://dx.doi.org/10.1016/j.tics.2018.12.001\)](http://dx.doi.org/10.1016/j.tics.2018.12.001). [Google Scholar \(https://scholar.google.com/scholar_lookup?title=Hallucinations+and+strong+priors&author=Corlett+P.+R.&author=Horga+G.&author=Fletcher+P.+C.&author=Alderson-Day+B.&author=Schmack+K.&author=Powers+A.+R.&publication+year=2018&journal=Trends+in+Cognitive+Sciences&volume=23&doi=10.1016%2Fj.tics.2018.12.001\)](https://scholar.google.com/scholar_lookup?title=Hallucinations+and+strong+priors&author=Corlett+P.+R.&author=Horga+G.&author=Fletcher+P.+C.&author=Alderson-Day+B.&author=Schmack+K.&author=Powers+A.+R.&publication+year=2018&journal=Trends+in+Cognitive+Sciences&volume=23&doi=10.1016%2Fj.tics.2018.12.001). [PubMed \(http://www.ncbi.nlm.nih.gov/pubmed/30583945\)](http://www.ncbi.nlm.nih.gov/pubmed/30583945)

Geertz, C. (1973) *The interpretation of culture*. Basic Books. [Google Scholar \(https://scholar.google.com/scholar_lookup?title=The+interpretation+of+culture&author=Geertz+C.&publication+year=1973\)](https://scholar.google.com/scholar_lookup?title=The+interpretation+of+culture&author=Geertz+C.&publication+year=1973)

Kroeber, A. L. & Kluckhohn, C. (1952) *Culture: A critical review of concepts and definitions*. Papers. Peabody Museum of Archeology & Ethnology, Harvard University. [Google Scholar \(https://scholar.google.com/scholar_lookup?title=Culture%3A+A+critical+review+of+concepts+and+definitions&author=Kroeber+A.+L.&author=Kluckhohn+C.&publication+year=1952\)](https://scholar.google.com/scholar_lookup?title=Culture%3A+A+critical+review+of+concepts+and+definitions&author=Kroeber+A.+L.&author=Kluckhohn+C.&publication+year=1952)

Larøi, F., Luhrmann, T. M., Bell, V., Christian, W. A. Jr., Deshpande, S., Fernyhough, C., Jenkins, J. & Woods, A. (2014) Culture and hallucinations: Overview and future directions. *Schizophrenia Bulletin* 40(Suppl_4):S213-20. [CrossRef \(http://dx.doi.org/10.1093/schbul/sbu012\)](http://dx.doi.org/10.1093/schbul/sbu012). [Google Scholar \(https://scholar.google.com/scholar_lookup?title=Culture+and+hallucinations%3A+Overview+and+future+directions&author=Lar%C3%B8i+F.&author=Luhrmann+T.+M.&author=Bell+V.&author=Christian+W.+A.&author=Deshpande+S.&author=Fernyhough+C.&author=Jenkins+J.&author=Woods+A.&publication+year=2014&journal=Schizophrenia+Bulletin&volume=40&doi=10.1093%2Fschbul%2Fsbu012\)](https://scholar.google.com/scholar_lookup?title=Culture+and+hallucinations%3A+Overview+and+future+directions&author=Lar%C3%B8i+F.&author=Luhrmann+T.+M.&author=Bell+V.&author=Christian+W.+A.&author=Deshpande+S.&author=Fernyhough+C.&author=Jenkins+J.&author=Woods+A.&publication+year=2014&journal=Schizophrenia+Bulletin&volume=40&doi=10.1093%2Fschbul%2Fsbu012). [PubMed \(http://www.ncbi.nlm.nih.gov/pubmed/24936082\)](http://www.ncbi.nlm.nih.gov/pubmed/24936082)

Lifshitz, M., van Elk, M. & Luhrmann, T. M. (2019) Absorption and spiritual experience: A review of evidence and potential mechanisms. *Consciousness and Cognition* 73:102760. [CrossRef \(http://dx.doi.org/10.1016/j.concog.2019.05.008\)](http://dx.doi.org/10.1016/j.concog.2019.05.008). [Google Scholar \(https://scholar.google.com/scholar_lookup?title=Absorption+and+spiritual+experience%3A+A+review+of+evidence+and+potential+mechanisms&author=Lifshitz+M.&author=van+Elk+M.&author=Luhrmann+T.+M.&publication+year=2019&journal=Consciousness+and+Cognition&volume=73&doi=10.1016%2Fj.concog.2019.05.008\)](https://scholar.google.com/scholar_lookup?title=Absorption+and+spiritual+experience%3A+A+review+of+evidence+and+potential+mechanisms&author=Lifshitz+M.&author=van+Elk+M.&author=Luhrmann+T.+M.&publication+year=2019&journal=Consciousness+and+Cognition&volume=73&doi=10.1016%2Fj.concog.2019.05.008). [PubMed \(http://www.ncbi.nlm.nih.gov/pubmed/31228696\)](http://www.ncbi.nlm.nih.gov/pubmed/31228696)

Luhrmann, T. M. (2012) *When God talks back: Understanding the American evangelical relationship with God*. Knopf. [Google Scholar \(https://scholar.google.com/scholar_lookup?title=When+God+talks+back%3A+Understanding+the+American+evangelical+relationship+with+God&author=Luhrmann+T.+M.&publication+year=2012\)](https://scholar.google.com/scholar_lookup?title=When+God+talks+back%3A+Understanding+the+American+evangelical+relationship+with+God&author=Luhrmann+T.+M.&publication+year=2012)

Luhrmann, T. M., Alderson-Day, B., Bell, V., Bless, J. J., Corlett, P., Hugdahl, K., Jones, N., Larøi, F., Moseley, P., Padmavati, R. & Peters, E. (2019) Beyond trauma: A multiple pathways approach to auditory hallucinations in clinical and nonclinical populations. *Schizophrenia Bulletin* 45(Suppl_1):S24-31. [CrossRef \(http://dx.doi.org/10.1093/schbul/sby110\)](http://dx.doi.org/10.1093/schbul/sby110). [Google Scholar \(https://scholar.google.com/scholar_lookup?title=Beyond+trauma%3A+A+multiple+pathways+approach+to+auditory+hallucinations+in+clinical+and+nonclinical+populations&author=Luhrmann+T.+M.&author=Alderson-Day+B.&author=Bell+V.&author=Bless+J.+J.&author=Corlett+P.&author=Hugdahl+K.&author=Jones+N.&author=Lar%C3%B8i+F.&author=Moseley+P.&author=Padmavati+R.&author=Peters+E.&publication+year=2019&journal=Schizophrenia+Bulletin&volume=45&doi=10.1093%2Fschbul%2Fsbys110\)](https://scholar.google.com/scholar_lookup?title=Beyond+trauma%3A+A+multiple+pathways+approach+to+auditory+hallucinations+in+clinical+and+nonclinical+populations&author=Luhrmann+T.+M.&author=Alderson-Day+B.&author=Bell+V.&author=Bless+J.+J.&author=Corlett+P.&author=Hugdahl+K.&author=Jones+N.&author=Lar%C3%B8i+F.&author=Moseley+P.&author=Padmavati+R.&author=Peters+E.&publication+year=2019&journal=Schizophrenia+Bulletin&volume=45&doi=10.1093%2Fschbul%2Fsbys110). [PubMed \(http://www.ncbi.nlm.nih.gov/pubmed/30715545\)](http://www.ncbi.nlm.nih.gov/pubmed/30715545)

Luhrmann, T. M. & Morgain, R. (2012) Prayer as inner sense cultivation: An attentional learning theory of spiritual experience. *Ethos* 40(4):359-89. [CrossRef \(http://dx.doi.org/10.1111/j.1548-1352.2012.01266.x\)](http://dx.doi.org/10.1111/j.1548-1352.2012.01266.x). [Google Scholar \(https://scholar.google.com/scholar_lookup?title=Prayer+as+inner+sense+cultivation%3A+An+attentional+learning+theory+of+spiritual+experience&author=Luhrmann+T.+M.&author=Morgain+R.&publication+year=2012&journal=Ethos&volume=40&doi=10.1111%2Fj.1548-1352.2012.01266.x\)](https://scholar.google.com/scholar_lookup?title=Prayer+as+inner+sense+cultivation%3A+An+attentional+learning+theory+of+spiritual+experience&author=Luhrmann+T.+M.&author=Morgain+R.&publication+year=2012&journal=Ethos&volume=40&doi=10.1111%2Fj.1548-1352.2012.01266.x)

Luhrmann, T. M., Padmavati, R., Tharoor, H. & Osei, A. (2015) Differences in voice-hearing experiences of people with psychosis in the USA, India and Ghana: Interview-based study. *The British Journal of Psychiatry* 206(1):41-44. [CrossRef](#) (<http://dx.doi.org/10.1192/bjp.bp.113.139048>). [Google Scholar](#) (https://scholar.google.com/scholar_lookup?title=Differences+in+voice-hearing+experiences+of+people+with+psychosis+in+the+USA%2C+India+and+Ghana%3A+Interview-based+study&author=Luhrmann+T.+M.&author=Padmavati+R.&author=Tharoor+H.&author=Osei+A&publication+year=2015&journal=The+British+Journal+of+Psychiatry&volume=206&doi=10.1192%2Fbjp.bp.113.139048&pages=41-44). [PubMed](#) (<http://www.ncbi.nlm.nih.gov/pubmed/24970772>).

Wilkinson, S. & Bell, V. (2016) The representation of agents in auditory verbal hallucinations. *Mind & Language* 31(1):104-126. [CrossRef](#) (<http://dx.doi.org/10.1111/mila.12096>). [Google Scholar](#) (https://scholar.google.com/scholar_lookup?title=The+representation+of+agents+in+auditory+verbal+hallucinations&author=Wilkinson+S.&author=Bell+V&publication+year=2016&journal=Mind+%26+Language&volume=31&doi=10.1111%2Fmila.12096&pages=104-126). [PubMed](#) (<http://www.ncbi.nlm.nih.gov/pubmed/26900201>).

Access

In response to: **Thinking through other minds: A variational approach to cognition and culture** (</core/product/9A10399BA85F428D5943DD847092C14A>)

[Related commentaries](#) (29) [Author response](#) (</core/product/ADD060A9EE6937A3104FA23290F2C519>).

Related content

Article

Posters

(</core/product/C21F73F4DF11176B04C4A9C81F8E60CC>)

[International Psychogeriatrics](#) (</core/product/A92395F884342781CC494B063CA2C0F8>).

Published online: 3 September 2007

Article

A New Measurement of Activities of Daily Living for Thai Elderly With Dementia

(</core/product/1ED47D72427EB02DED8C752838D68351>)

[International Psychogeriatrics](#) (</core/product/A92395F884342781CC494B063CA2C0F8>).

Published online: 10 January 2005

Article

Identifying factors of activities of daily living important for cost and caregiver outcomes in Alzheimer's disease

(</core/product/D3D7E45963F8AB23374079192860F930>)

Catherine Reed ([/core/search?filters%5BauthorTerms%5D=Catherine Reed&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Catherine+Reed&eventCode=SE-AU)), Mark Belger ([/core/search?filters%5BauthorTerms%5D=Mark Belger&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Mark+Belger&eventCode=SE-AU)), Bruno Vellas ([/core/search?filters%5BauthorTerms%5D=Bruno Vellas&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Bruno+Vellas&eventCode=SE-AU)), Jeffrey Scott Andrews ([/core/search?filters%5BauthorTerms%5D=Jeffrey Scott Andrews&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Jeffrey+Scott+Andrews&eventCode=SE-AU)), Josep M. Argimon ([/core/search?filters%5BauthorTerms%5D=Josep M. Argimon&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Josep+M.+Argimon&eventCode=SE-AU)), Giuseppe Bruno ([/core/search?filters%5BauthorTerms%5D=Giuseppe Bruno&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Giuseppe+Bruno&eventCode=SE-AU)), Richard Dodel ([/core/search?filters%5BauthorTerms%5D=Richard Dodel&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Richard+Dodel&eventCode=SE-AU)), Roy W. Jones ([/core/search?filters%5BauthorTerms%5D=Roy W. Jones&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Roy+W.+Jones&eventCode=SE-AU)), Anders

Wimo ([/core/search?filters%5BauthorTerms%5D=Anders Wimo&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Anders+Wimo&eventCode=SE-AU)) and Josep Maria Haro ([/core/search?filters%5BauthorTerms%5D=Josep Maria Haro&eventCode=SE-AU](/core/search?filters%5BauthorTerms%5D=Josep+Maria+Haro&eventCode=SE-AU))

[International Psychogeriatrics](#) (</core/product/A92395F884342781CC494B063CA2C0F8>).

Published online: 26 August 2015

Article

Posters

(</core/product/12CAABED9DA107BB3E8475EFB96FC83C>)

[International Psychogeriatrics](#) (</core/product/A92395F884342781CC494B063CA2C0F8>).

Published online: 15 August 2011

Article

Comparison of Three Instruments for Activity Disability in Acute Ischemic Stroke Survivors (/core/product/E07CA6DDEE9EC07C238D902723593621)

Qian Wu (/core/search?filters%5BauthorTerms%5D=Qian Wu&eventCode=SE-AU), Aijie Tang (/core/search?filters%5BauthorTerms%5D=Aijie Tang&eventCode=SE-AU), Shuzhen Niu (/core/search?filters%5BauthorTerms%5D=Shuzhen Niu&eventCode=SE-AU), Aiping Jin (/core/search?filters%5BauthorTerms%5D=Aiping Jin&eventCode=SE-AU), Xiaoqing Liu (/core/search?filters%5BauthorTerms%5D=Xiaoqing Liu&eventCode=SE-AU), Li Zeng (/core/search?filters%5BauthorTerms%5D=Li Zeng&eventCode=SE-AU), Jinxia Jiang (/core/search?filters%5BauthorTerms%5D=Jinxia Jiang&eventCode=SE-AU), Jennifer Kue (/core/search?filters%5BauthorTerms%5D=Jennifer Kue&eventCode=SE-AU), Yan Shi (/core/search?filters%5BauthorTerms%5D=Yan Shi&eventCode=SE-AU) and Xiaoping Zhu (/core/search?filters%5BauthorTerms%5D=Xiaoping Zhu&eventCode=SE-AU)

[Canadian Journal of Neurological Sciences](#) (/core/product/A15C3D1075D5ECE8B8BA8069337C929A)

Published online: 14 July 2020

Article

Changes in depressive symptoms and functional disability among community-dwelling depressive older adults (/core/product/695D203F3A5F59685B2F623F61F330F7)

Ma Shwe Zin Nyunt (/core/search?filters%5BauthorTerms%5D=Ma Shwe Zin Nyunt&eventCode=SE-AU), May Li Lim (/core/search?filters%5BauthorTerms%5D=May Li Lim&eventCode=SE-AU), Keng Bee Yap (/core/search?filters%5BauthorTerms%5D=Keng Bee Yap&eventCode=SE-AU) and Tze Pin Ng (/core/search?filters%5BauthorTerms%5D=Tze Pin Ng&eventCode=SE-AU)

[International Psychogeriatrics](#) (/core/product/A92395F884342781CC494B063CA2C0F8).

Published online: 22 May 2012

Article

Associations Between Psychotic Symptoms and Dependence in Activities of Daily Living Among Older Adults With Alzheimer's Disease (/core/product/09B770C8846F50FCC9AA18CF89CEE81A)

Mun Tran (/core/search?filters%5BauthorTerms%5D=Mun Tran&eventCode=SE-AU), Michel Bédard (/core/search?filters%5BauthorTerms%5D=Michel Bédard&eventCode=SE-AU), D. William Molloy (/core/search?filters%5BauthorTerms%5D=D. William Molloy&eventCode=SE-AU), Sacha Dubois (/core/search?filters%5BauthorTerms%5D=Sacha Dubois&eventCode=SE-AU) and Judith A. Lever (/core/search?filters%5BauthorTerms%5D=Judith A. Lever&eventCode=SE-AU)

[International Psychogeriatrics](#) (/core/product/A92395F884342781CC494B063CA2C0F8).

Published online: 10 January 2005

Article

The complex relationship between depressive symptoms and functional limitations in community-dwelling older adults: the impact of subthreshold depression (/core/product/815C6263CA79795C9E0FF6029B6E4460)

C. F. Hybels (/core/search?filters%5BauthorTerms%5D=C. F. Hybels&eventCode=SE-AU), C. F. Pieper (/core/search?filters%5BauthorTerms%5D=C. F. Pieper&eventCode=SE-AU) and D. G. Blazer (/core/search?filters%5BauthorTerms%5D=D. G. Blazer&eventCode=SE-AU)

[Psychological Medicine](#) (/core/product/2E4A9A64B37548F25362F3235C223463).

Published online: 9 April 2009

Article

Posters

(/core/product/8E1FB1D506196E60A8EF32FB0C8271F4)

[International Psychogeriatrics](#) (/core/product/A92395F884342781CC494B063CA2C0F8).

Published online: 1 September 2009

Article

Neuropsychiatric symptoms, functional impairment and executive ability in Thai patients with Alzheimer's Disease (/core/product/5553F8EB4BBF5F353804194E4120D87F)

Vorapun Senanarong (/core/search?filters%5BauthorTerms%5D=Vorapun Senanarong&eventCode=SE-AU), Niphon Pongvarin (/core/search?

[filters%5BauthorTerms%5D=Nipon Pongvarin&eventCode=SE-AU](#)), [Piyanyu Jamjumras \(/core/search?filters%5BauthorTerms%5D=PiyanyuJamjumras&eventCode=SE-AU\)](#), [Akanittha Sriboonroung \(/core/search?filters%5BauthorTerms%5D=AkanitthaSriboonroung&eventCode=SE-AU\)](#), [Chotipat Danchaiwijit \(/core/search?filters%5BauthorTerms%5D=ChotipatDanchaiwijit&eventCode=SE-AU\)](#), [Suthipol Udomphanthuruk \(/core/search?filters%5BauthorTerms%5D=SuthipolUdomphanthuruk&eventCode=SE-AU\)](#) and [Jeffrey L. Cummings \(/core/search?filters%5BauthorTerms%5D=JeffreyL.Cummings&eventCode=SE-AU\)](#)
[International Psychogeriatrics \(/core/product/A92395F884342781CC494B063CA2C0F8\)](#).

Published online: 16 February 2005

Powered by **UNSILO**