Enhancing Cultural Competence with Cultural Neuroscience and Ethno-Psychopharmacology: Starting an Interdisciplinary Dialogue

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Learning Objectives

- Upon the completion of this presentation, the learner will be able to describe findings from cultural neuroscience related to psychopathology, self construal, cognition and emotion.

- Upon the completion of this presentation, the learner will be able to describe findings from ethno-psychopharmacology related to how cultural and genetic differences influence the effectiveness of an individual’s response to psychiatric medication.

- Upon the completion of this presentation, the learner will be able to recognize how findings from cultural neuroscience and ethno-psychopharmacology shed light on neurobiological variability and universalism.

The speaker has no conflicts of interest to report.
Why Cultural Neuroscience and Ethno-Psychopharmacology?

- Growing cultural and ethnic diversity of the clients we serve
- Increasingly being an effective provider means being a culturally competent provider
- Past neuroscience and psychopharmacological research has overwhelmingly been conducted with Westerners
- Cultural neuroscience and ethno-psychopharmacology can increase our sensitivity to cultural and ethnic differences
- Starting a dialogue with these academic disciplines
- Caveat: Every individual is unique

Cultural Neuroscience

- How does culture (shared values, beliefs, and practices) influence neurobiology (neural and genetic processes)?
- How does neurobiology influence culture?

Cultural Neuroscience Model

- Culture → Mind → Brain → Genes
- Traditional Psychiatric Model

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Earle
The Emergence of Cultural Neuroscience  
2007 to the Present  
(Chiao, 2010; Chiao et al., 2014; Han & Popple, 2011; Han et al., 2013; Kim & Sasaki, 2014; Rule, 2014)

- Emerged from several disciplines: cultural psychology, neuroscience, and neurogenetics
- Draws on methodologies from these different disciplines: fMRI, allelic frequencies, and other techniques
- Initial focus on comparing Western and East Asian cultures
- Differences: visual perception, attention, causality, music processing, mathematics, face recognition, memory, theory of mind, social support, and language
- Today's talk: Psychopathology, self, emotion, and cognition

Cultural Neuroscience: Psychopathology  
(Chiao & Blizinsky, 2010)

- Chiao and Blizinsky studied polymorphisms of the serotonin uptake transporter gene (5-HTTLPR) in 29 nations around the world (n=50,135)
- Polymorphisms - alternate forms of a DNA sequence that are common in a population (not a mutation)
- The serotonergic uptake transporter gene (5-HTTLPR) has two key polymorphisms: Short (S) allele and Long (L) allele
- Allele – Different versions of the same gene
- The short (S) allele confers a greater risk for anxiety and mood disorders in the face of life stressors

Cultural Neuroscience: Psychopathology  
(Chiao & Blizinsky, 2010)

- East Asian Nations - higher frequency of Short (S) alleles, but lower prevalence of anxiety and mood disorders
- Euro-American Nations - lower frequency of Short (S) allele, but higher prevalence of anxiety and mood disorder
- Why?
- Chiao and Blizinsky also explored the dominant cultural values in each nation: Individualism and Collectivism
- Individualism: independence, self expression, individual goals over collective goals, uniqueness
- Collectivism: connection/other-focused, social harmony, group goals over individual goals, fulfilling duties and obligation to others
Cultural Neuroscience: Psychopathology
(Chiao & Blizinsky, 2010; Hechtman, Railia, Chiao, & Gruber, 2013; Tan, 2014)

- High levels of collectivist cultural values mediated the relationship between a high frequency of the short (S) allele and a lower prevalence of anxiety and mood disorders in East Asian nations.
- Collectivist cultural values appeared to buffer East Asian nations from anxiety and mood disorders despite their genetic predisposition.
- Recent research indicates a neurobiological plasticity related to the prevalence of mood disorders such as depression in individuals from East Asia.
- Chinese individuals who immigrated to the U.S. had higher rates of MDD than Chinese individuals living in Taiwan; however, recent Chinese immigrants to the U.S. had lower rates of MDD than U.S. born Chinese Americans (but still lower than Caucasian Americans).

Cultural Neuroscience: Self
(Markus & Kitayama, 1995; Triandis, 1995; Zhang, Zhu, & Han, 2011; Zhu et al., 2007)

- Western: Independent Self – Specific traits (drive behavior), unique, separate/autonomous, Self is the same across contexts.
- East Asia: Interdependent Self – Connected/less differentiated from others, connection to and role within social group shapes the self, the self changes with the context.
- Zhu et al. (2007) explored the neural activation patterns of Westerners and Chinese individuals when thinking about one’s self, a close other (mother), and a distant other (a celebrity).
- Because of the interdependent self construal style of East Asians, the researchers predicted that this would be reflected in a shared neural activation pattern for the self and a close other like mother.

Cultural Neuroscience: Self
(Zhu et al., 2007)

- Chinese subjects activated the medial prefrontal cortex for the both the self and a close other such as mother; cingulate cortex for celebrity.
- Western subjects just used the medial prefrontal cortex for the self and the cingulate cortex for mother and a celebrity.

Chinese - Interdependent
Western - Independent
Cultural Neuroscience: Self
(Chen et al., 2013)

- Recent research indicates a level of plasticity in the neural processing of self
- Chen et al. (2013) studied Chinese individuals who elected to immigrate to the United States
- He found that through the immigration process they may develop a more independent self construal
- When that happens the medial prefrontal cortex will activate more strongly for the self compared to a close other such as mother

Cultural Neuroscience: Emotion
(Cheon et al., 2013; Chiao et al., 2014; Han et al., 2013; Kim & Sasaki, 2013)

- Cultural neuroscience researchers have found different neural processing of emotion when comparing Westerners and East Asians
- For example, Cheon et al. (2013) compared the activation of the emotional pain matrix of Koreans to North American subjects viewing scenes of emotional distress
- They predicted that because of the collectivist cultural values which emphasize being more other-focused that Korean subjects would evidence greater activation levels
- North American subjects who have individualistic values and are more self-focused would evidence less activation

Cultural Neuroscience: Emotion
(Chen et al., 2013)

- Both groups activated the emotional pain matrix when viewing emotionally distressing scenes
- However, as predicted, Koreans had significantly higher levels of being other-focused and significantly greater activation of the emotional pain matrix compared to North Americans

Anterior Cingulate Cortex
Anterior Insula Cortex
Emotional Pain Matrix
Cultural Neuroscience: Cognition
(Nisbett, Peng, Choi, & Norenzayan, 2001)

• Past psychological research has found that individuals from Western and East Asian cultures have different cognitive styles: analytic versus holistic

• Western: Analytic – a focus on individual objects in the foreground and their features, rather than background/context or the relationship among foreground objects and background/context

• East Asian: Holistic – a focus on background, contextual information, and the relationship among foreground objects and background/context

Cultural Neuroscience: Cognition
(Goh et al., 2007; Goh et al., 2013; Goh, Tan, & Park, 2009; Gutchess et al., 2006)

• Cultural neuroscience research has found support for different cognitive styles (analytic vs. holistic) between Westerners and East Asians

• Goh, Tan and Park (2009) used eye tracking technology to assess the visual attention of Westerners and East Asians as they viewed pictures with changing objects and backgrounds

• Westerners responded more strongly to changes in foreground objects than background manipulations and had more eye movement focused within a foreground object

• A significant portion of the eye movement of East Asians shifted between the background and foreground objects

Ethno-Psychopharmacology
Ethno-Psychopharmacology
(Ng et al., 2013; Sethi, 2012; Silva, 2013; Warren, 2012)

• Studies how cultural and genetic differences influence the effectiveness of an individual’s response to psychiatric medication
• Genetic polymorphisms: neurotransmitters and CYP 450 enzymes
• Neurotransmitter: Serotonin uptake transporter gene (5-HTTLPR)
  - Short (S) and Long (L) alleles as well as genotypic variations (L/L, L/S, and S/S)
• CYP 450 Enzymes: CYP2D6 and CYP2D19
• Cultural variations in diet and ingestion of substances interact with CYP 450 enzymes to influence metabolism

Ethno-Psychopharmacology: Serotonin Polymorphism
(Bouman et al., 2014; Lin, Chen, Yu, & Wang, 2013; Ng et al., 2013; Silva, 2013)

• Researchers investigated the effectiveness of Escitalopram/Lexapro for treating depression amongst Caucasians and Koreans with L/L, L/S, or S/S genotypes
• The results indicated that Caucasians with the L/L, but not L/S, or S/S had reductions in depressive symptoms and higher response and remission rates compared to Koreans
• Past research has also indicated that Caucasians with the L allele respond better to antidepressants
• However, past research has also found that East Asians with higher frequencies of the S allele respond better to antidepressants

Ethno-Psychopharmacology: CYP2D6 Polymorphisms
(Bower, Butler, Report Rev, 2012; Silva, 2013)

• CYP2D6 polymorphism frequencies differ by race and ethnicity (80 recognized CYP2D6 polymorphisms)
• Metabolizes: fluoxetine, paroxetine, venlafaxine, duloxetine, mirtazapine, trazodone, risperidone, aripiprazole, olanzapine
• CYD2D6*10 and CYP2D*17 are more prevalent in East Asian and Sub-Saharan African individuals and are associated with lower enzyme activity
• Lower enzyme activity often results in East Asians and Africans requiring smaller doses of antidepressants and antipsychotics to achieve a therapeutic response
• CYP2D6*4 is found in 20-25% of Europeans and is associated with a high rate of poor metabolism leading to higher drug levels accumulating in the body
Ethno-Psychopharmacology: CYP2D19 Polymorphisms

- CYP2D19 polymorphism frequencies differ by race and ethnicity (Two common polymorphisms: CYP2D19*2 and CYP2D19*3)
- Metabolizes: citalopram, diazepam, amitriptyline, clomipramine, imipramine
- CYP2D19*3 found only in East Asians
- CYP2D19*3 plus CYP2D19*2 thought to play a role in the high rates of poor metabolism of certain psychotropic drugs among East Asians

Ethno-Psychopharmacology: Diet and CYP 450 Enzymes

- Researchers investigated the effect of diet on the metabolism of clomipramine by Sudanese and Asians before and after they immigrated to England
- Before immigration to England the subjects ate traditional ethnic foods and had a very slow rates of metabolism of clomipramine (CYP1A2)
- After immigration the subjects adopted dietary habits more common in England and their metabolism of Clomipramine increased and became similar to English individuals

Implications
Cultural Neuroscience, Ethno-Psychopharmacology, and Neurobiological Complexity

- Neurobiological Plasticity
- Culture and ethnicity can influence neurobiological functioning
- Universalism: serotonin, frontal cortex, emotional pain matrix, CYP 450 enzymes
- Neurobiological Variability and Universalism
- Increased neurobiological complexity

Culture-Gene Coevolution Theory: The Source of Neurobiological Complexity?
[Chiao et al., 2014; Fincher et al., 2008; Gintis, 2011; Richerson, Boyd, & Henrich, 2010]

Culture → Neural Activity → Behavior
Gene

Adapted from Chiao et al., 2014

Cultural Neuroscience and Ethno-Psychopharmacology: What are the Implications for Psychiatric Nursing?

- Cultural Competence: Cultural neuroscience and ethno-psychopharmacology can help us as clinicians better understand the neurobiological complexity (variability and universalism) that clients bring to our work settings
- Improve our Professional Preparation: Cultural neuroscience and ethno-psychopharmacology might enhance psychiatric nursing education
References
