

Gallaudet Chronicles of Psychology

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Letter from the Student Editors

We are happy to announce that after months of hard work we can finally welcome you to the first issue of the 4th volume of the *Gallaudet Chronicles of Psychology*. In 2007, the *Chronicles* was created as a place where students can share their ideas, both research and theoretically oriented. The creators of the *Chronicles* hoped that it would become a journal reflecting the uniqueness of work, life, and learning that happens here at Gallaudet University and within the Deaf Community at large. In continuation of the original vision, we are striving to publish students' manuscripts that fulfill the requirements of professional publication, regardless of its form. We seek essays, personal narratives, theoretical and empirical writings, case studies, critiques, etc. We are happy to say that since the reactivation of the *Chronicles*, many students became actively involved in this project as both authors and reviewers.

The majority of our reviewers decided to stay involved in creation of the next issue of the *Chronicles* and a several new students decided to send us their manuscripts. This increased interest in publishing in our journal combined with a rigorous reviewing process resulted in decrease of the manuscript acceptance rate. From the submitted works, with the immense help of our invaluable reviewers, we decided to accept five diverse yet remarkable articles. Thus, in this issue, you will find a varied range of styles from theoretical essays to a critique and a mixed methods research study. First, the article of Mrs. **Liz Courtney** explores whether or not motivational interviewing will increase treatment compliance in patients with PTSD. Mr. **Garry Wright** explores and analyzes current research on the epidemiological information on TORCH infections. Mr. **Nicolas Gala** discusses neurological components that influence behaviors associated with lust, attraction, and attachment. Ms. **Yasmeen Alhasawi** provides a comprehensive insight on the theory behind audism, its history and impact on deaf and hard-of-hearing individuals.

In our final words, we would like to thank those who contributed to the development of the 4th volume of the *Chronicles*. We could not have succeeded in accomplishing this task without the tremendous work of the authors and reviewers. We also want to give a very special thanks to Dr. Lori Day who has overseen this project since its beginning. We hope that you will find this issue interesting and that future issues will continue to present the fascinating works of our students.

Sincerely,

Gregory Farber, Joanna Dizura, and Haley Popp,
Student Editors-in-Chief

Letter from the Faculty Editorial Supervisor

I am excited about the 4th Volume of the Gallaudet Chronicles of Psychology and to see all of the work that has gone into continuing this publication. It remains a truly student-led effort under the leadership of the student co-editors, Ms. Joanna Dziura, Mr. Gregory Farber, and Ms. Haley Popp. They have been essential to the revival of the Chronicles and deserve recognition for their work in producing this issue. I'd also like to thank Ms. Dziura for the time and energy she has put into the Chronicles as she has now completed her formal role in this position. This publication would also not be possible without the participation of student authors and reviewers.

Part of the mission of the Department of Psychology at Gallaudet University is to instill in students a scholarly understanding of psychology and its application to the lives of deaf and hard of hearing persons through the production of scholarly works. The Chronicles is one avenue through which students can obtain hands-on experience with the process of producing scholarly works.

The Chronicles aims to provide an atmosphere of collegial and supportive feedback to often first-time authors to orient them to the process of peer review and revising and resubmitting their work. Reviewers are provided with clear instructions and guidance on completing a peer review, giving them a critical lens through which they can then apply to their own research. I encourage all psychology graduate students to consider getting involved in some aspect of future editions of the Chronicles, and I look forward to reading issues to come!

Sincerely,

Lori Day, PhD
Faculty Editorial Supervisor

The Use of Motivational Interviewing to Increase Compliance for Post Traumatic Stress Disorder (PTSD) Treatment

Rena “Liz” Courtney, M.A.

Department of Psychology

The Veterans Health Administration currently uses Cognitive Processing Therapy (CPT) and Prolonged Exposure Therapy (PE) to treat Posttraumatic Stress Disorder (PTSD) (Department of Veterans Affairs, 2013). Though these treatments have been suggested to be effective, research has shown that the dropout rates for these approaches are considerable (Najavits, 2015). The present article reviews the literature on the effectiveness of PE and Motivational Interviewing (MI). A proposal for a quantitative study is then presented in order to examine whether one session of MI increases treatment compliance for PE within an outpatient clinic at a VA Medical Center in the Southeastern region focused on PTSD treatment. Furthermore, the feasibility of implementing MI within the outpatient clinic model is discussed.

Keywords: Motivational Interviewing, Prolonged Exposure Therapy, PTSD treatment, veterans

Posttraumatic Stress Disorder (PTSD) is a prevalent mental health concern for both civilian and military populations. Based on the diagnostic criteria set forth in the DSM-5 (American Psychiatric Association, 2013) one must have experienced a trauma and be exhibiting symptom clusters in order to be diagnosed with PTSD: intrusive memories, avoidance, negative alterations in cognition or mood, alterations in arousal or reactivity. The prevalence of PTSD in the world population, including both military and civilian samples, is estimated to be between 3.5% and 6% (Ciechanowski, Katon, Stein & Hermann, 2012). Within military populations it was estimated that 13.8% of soldiers returning home from Iraq and Afghanistan had a current diagnosis of PTSD (Tanielian, & Jaycox, 2008). Other studies suggested estimates to be as high as 20% (Ramchand, Schell, Karney, Osilla, Burns & Caldarone, 2010).

The Veterans Health Administration suggests that there are two major evidence-based treatments for PTSD, namely Cognitive Processing Therapy (CPT) and Prolonged Exposure Therapy (PE) (Department of Veterans Affairs, 2013). These therapies are currently being administered in mental health departments of VA Medical Centers all across the country, due in part to the research demonstrating its efficacy (Forbes et al., 2012; McLean, Asnaani & Foa, 2015). Both therapies involve the reprocessing and therefore re-experiencing of the traumatic event. PE, in particular, involves an average of eight through fifteen sessions, which requires a person to imagine the trauma happening again and again with

the expectation that repeated exposure will eventually cause the person to experience less distress over time (Foa, Hembree & Rothbaum, 2007). The client is exposed through in-vivo (or real life) exposure through homework assignments that are completed between sessions and through imaginal exposure during the therapy session (Foa, Hembree & Rothbaum, 2007). Imaginal exposure typically consists of the client telling and retelling the story of the traumatic event with his or her eyes closed for forty-five minutes using the present tense (Foa, Hembree & Rothbaum, 2007). Over time, repeated exposure to these memories through the retelling of the event and exposure to in-vivo situations leads to a decrease in emotional distress. This therapy was developed based on the idea of classical conditioning, in which humans learn that two things are paired together. For someone who experiences a traumatic event, that memory pairs objects, people, thoughts, sights, sounds, smells, etc. with feelings of terror in order to prevent a person from experiencing the dangerous situation again. However, through repeated exposure it is theorized that the reaction to the memory of the event and all of its associations can be unlearned since they are being re-experienced within a safe environment (Foa, Hembree & Rothbaum, 2007).

Research that shows the efficacy of PE supports the Department of Veteran Affairs and the Department of Defense’s (DoD) decision to make the therapies the treatments of choice for PTSD (Eftekhari, Ruzek, Crowley, Rosen, Greenbaum &

Karlin, 2013). The literature also demonstrates that there is a significant dropout rate for PE since people who have experienced trauma do not want to relive their traumatic experiences over and over again (Najavits, 2015). The dropout rates for PE have been shown to increase for PE if a person has also been diagnosed with a substance use disorder (Brady, Dansky, Back, Foa & Carroll, 2001), is male (Harpaz-Rotem & Rosenheck, 2011) or the therapy is being held in a group format (Imel, Laska, Jakupcak & Simpson, 2013). Unfortunately, the rate of veterans diagnosed with PTSD and comorbid substance use disorder is higher than that of the civilian population (Nazarian, Kimerling & Frayne, 2012), most of the armed forces consist of males (Clever & Segal, 2013) and VA Medical Centers that follow the VA/DoD guidelines often offer PE in a group format (Forbes et al., 2010), resulting in a higher than expected dropout rate and low treatment compliance.

Motivational interviewing is an intervention that was developed by Miller and Rollnick (2012) and has been shown to be effective in increasing treatment compliance. Motivation interviewing focuses on ambivalence as a normal part of the change process and encourages clinicians to roll with resistance through various techniques instead of seeing it as a barrier to treatment. One motivations technique, for example, suggests that clinicians help the client to make a pro and con list of how completing treatment will suit his or her values, wants and needs (Miller & Rollnick, 2012). Smith, Heckermeier, Kratt and Mason (1997) found that such motivational interviewing techniques were effective in increasing treatment adherence for a behavioral weight-control program in women with obesity. It has also been shown to increase outpatient treatment adherence for those who were dually diagnosed (Swanson, Pantalon & Cohen, 1999).

Motivational interviewing has also been shown to be useful in increasing client's readiness for change before beginning psychiatric treatment in order to increase treatment compliance. For instance, Swanson, Pantalon and Cohen (1999) found that in their sample of 121 inpatient psychiatric patients, motivational interviewing led to a statistically significant increase in the number of patients that attended their first outpatient appointment compared to a control group that received treatment as usual. Notably, 77% of these patients were also diagnosed with a substance use disorder, resembling the veteran population that is often dually diagnosed (1999).

Motivational interviewing has also been used in veteran populations in order to increase

treatment compliance. Studies have shown that motivational interviewing can increase a veteran's adherence to treatment for several disorders, particularly anxiety (Arkowitz, Miller & Rollnick (Eds.), 2015; Westra & Dozois, 2006). It has also been suggested that motivational interviewing should be used in adjunct with exposure treatments, such as PE, since ambivalence about beginning such an overwhelming treatment is common (Slagle & Gray, 2007). Furthermore, Murphy, Thompson, Murray, Rainey & Uddo (2009) also found that motivational interviewing was effective in increasing treatment compliance for a year-long cognitive behavioral therapy group focused on the treatment of PTSD. Of note, this study was conducted in a VA treatment center and increased treatment compliance for a group setting. This study also was the first randomized control trial that demonstrated the efficacy of using motivational interviewing to increase the likelihood that veterans would participate in PTSD treatment, though the researchers focused on a CBT group versus a PE group.

Currently, the VA Medical Center in the Southeastern region has an entire department that is dedicated to the treatment of veterans diagnosed with PTSD that is related to a traumatic event that occurred during their active duty military career. A veteran can be referred to the department via a consult that is placed by their provider upon their discovery of PTSD symptoms related to the veteran's military service. After attending a general information session that serves as an orientation to the program, they are referred to an intake session, which consists of a diagnostic interview and screening procedure to determine eligibility. If eligibility is supported, the veteran is referred to either a CPT or PE treatment group. Treatment is provided in a group format to offset the cost of treatment and to address limited staff availability, though individual treatment is also available. These groups typical last for approximately 10 sessions, and are either released from trauma services, or referred back to the mental health clinic for additional services.

As previously mentioned the dropout rate for PE, including the PE groups offered in trauma services at the VA Medical Center in the Southeastern region, is significantly high. Though research has established the efficacy of PE, a veteran cannot experience the benefits of the treatment if he or she does not remain in the group. As a matter of fact, it has been suggested that dropping out of an exposure treatment early can actually lead to a worsening of symptoms (Lilienfeld, 2007). Based on

the literature that suggested motivational interviewing may increase treatment compliance for psychiatric disorders and has been shown to be effective in populations that have been diagnosed with multiple diagnoses (Swanson, Pantaloni & Cohen, 1999), as well in veteran populations for group treatment (Murphy, Thompson, Murray, Rainey & Uddo, 2009) it may be theorized that motivational interviewing would be effective in increasing treatment adherence for PE groups. Therefore, the research questions for the current proposal are as follows: 1.) Does MI increase the likelihood that veterans within in the Trauma Services Department will complete all ten sessions of PE?; 2.) Does implementing MI before beginning PE increase treatment outcomes (decrease in PTSD symptomatology)?; 3.) Is it feasible to implement one session of MI before beginning group therapy for PE within a Trauma Services Department? The hypotheses for the current study are as follows, respectively: 1.) MI will increase the likelihood of treatment completion, 2.) The experimental group will have a statistically significant decrease in PTSD symptoms compared to the control group, and 3.) It is feasible to implement MI into the trauma services department.

Methods

Participants

Participants for the proposed study will be recruited in the Trauma Services Department at a VA Medical Center in the Southeastern region upon their referral for the treatment of PTSD. In order to ensure that the sample is stratified based on current demographics for the armed forces and therefore representative of veterans being served in mental health settings across the country, approximately 80% of the sample will be male. Additional demographic data on years of service, age and race/ethnicity will also be stratified according to current demographics for the armed forces. A total of 500 participants will be recruited for this study to guarantee sufficient power for later statistical analyses.

Instruments

Demographic Questionnaire

The demographic questionnaire is a study-specific instrument that was developed to measure the age, gender, education, race, ethnicity, education, combat exposure, and substance-use of each veteran. There are additional questions related to medical and mental health in order to better understand why the

veteran had chosen to participate in the Veterans Affairs Health Care System.

Posttraumatic Stress Disorder Checklist 5 (PCL-5)

The PCL-5 was designed to screen for PTSD based on the DSM 5 criteria for PTSD (Weathers et al., 2013). It is a 20-item questionnaire. The first 5 items refer to the re-experience symptoms group (criterion B). The following 7 items refer to the emotional avoidance/numbing (criterion C), and the last 5 items address hyperarousal (criterion D). The patient is asked to rate the severity and intensity on a scale of 1-4, resulting in a total score of 80. It is generally accepted that the cutoff for a clinical diagnosis of PTSD may result from a score of 38 or above, given additional evidence of symptoms based on clinical judgment. The PCL was shown to have a 0.90 level of correlation with the Clinician-Administered PTSD Scale (Blanchard, Jones-Alexander, Buckley & Forneris, 1996) and has been used extensively throughout the literature on PTSD.

Review of Medical Records

The Veterans Health Administration has an electronic medical record system that is standardized for every medical center and community-based outpatient clinic (CBOC) in the country. These medical records include information on upcoming appointments for each veteran, the notes for those visits and if a veteran cancels or no-shows for an appointment. At the end of the study, the medical record for each research participant will be reviewed in order to calculate the attrition rate and to ensure that the veteran did attend all sessions of the PE groups.

Feasibility Questionnaire

A study-specific questionnaire will be included in order to determine how feasible the providers believe the implementation of motivational interviewing into the second intake interview was for them (See Appendix A). The scale consists of 5 Likert-type scale questions, as well as the open-ended request for comments from the provider related to their experience of implementing the intervention.

Procedure

The participants for this study will be recruited during their first intake interview with trauma services. During the first intake session, veterans will then be consented to participate using informed consent forms that have been approved by the DC VA Medical Center's Institutional Review

Board (IRB) and will also be required to fill out a Health Insurance Portability and Accountability Act (HIPPA) form, in accordance with hospital research procedures. The veteran will then be randomly selected by using their participant numbers to an experimental group that will go through a motivational interview during the second intake session, or to a control group that will consist of treatment as usual which typically involves psychoeducation about PTSD. Upon completing the second intake session where they do or do not receive motivational interviewing, the veteran will then attend an orientation session, following the current trauma service pattern. Next, the veterans will be begin to attend PE group therapy sessions. In order to control for the impact of the therapist and individual differences, the same provider will be leading both the experimental and control groups for the PE sessions. The provider will be blind as to which group is the experimental versus the control group in order to control for bias. The groups will consist of approximately ten participants per group, with 250 participants assigned to each group. In accordance with PE manualized treatment, the provider will ask the veterans in each group to fill out a PCL-5 on a weekly basis in order to track the impact of the treatment on their PTSD symptoms. This will also ensure that measures will reflect the last and most recent point of progress if a veteran decides to drop out from the group. At the end of 10 sessions, the veterans will fill out their last PCL-5 and be referred to other departments, following the typical trauma services procedures.

Proposed Analyses

As previously stated, the research questions for the current research study were as follows: 1.) Does MI increase the likelihood that veterans within in the Trauma Services Department will complete all 10 sessions of PE?; 2.) Does implementing MI before beginning PE increase treatment outcomes (decrease in PTSD symptomatology)?; 3.) Is it feasible to implement one session of MI before beginning group therapy for PE? The hypotheses for the current study are as follows, respectively: MI will increase the likelihood of treatment completion, the experimental group will have a statistically significant decrease in PTSD symptoms compared to the control group, and it is feasible to implement MI into the trauma services department. In order to test the first hypothesis, a chi-square analysis will be performed in order to determine if the participation in 1 session of MI increases the likelihood of completing all 10 sessions of PE. The second research question will be tested using an Analysis of Covariance to compare the differences between the groups on pre and post

scores on the PCL-5. Lastly, a qualitative feasibility analysis and descriptive statistics will be utilized to examine the technical, economical, legal, operational and scheduling aspects of implementing MI into the intake session of the trauma services department.

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Did you feel like you were able to finish the motivational interviewing session within the 60-minute appointment time?

- ___ 1 = Not at all
- ___ 2 = With Much Difficulty
- ___ 3 = With Some Difficulty
- ___ 4 = Without Much Difficulty
- ___ 5 = Without Any Difficulty

How do you think adding motivational interviewing impacted your patient’s level of motivation at the end of the second intake session?

- ___ 1 = Significantly Decreased Motivation
- ___ 2 = Slightly Decreased Motivation
- ___ 3 = No Change
- ___ 4 = Slightly Increased Motivation
- ___ 5 = Significantly Increased Motivation

How feasible do you believe implementing motivational interviewing into the second intake session is for your normal practice at this time?

- ___ 1 = Not At All
- ___ 2 = A Little Bit
- ___ 3 = Somewhat Unfeasible, Somewhat Feasible
- ___ 4 = Fairly Feasible
- ___ 5 = Very Feasible

Please feel free to add any additional comments, questions or concerns you have about implementing motivational interviewing into the second intake session.

Appendix A

Feasibility Questionnaire

Please respond to each of the following questions, indicating your opinion on implementing motivational interviewing into the second intake session.

How easy/difficult was it to provide a brief motivational interviewing session during the second intake with your patient?

- ___ 1 = Impossible
- ___ 2 = Very Difficult
- ___ 3 = Somewhat Difficult, Somewhat Easy
- ___ 4 = Fairly Easy
- ___ 5 = Easy

How did motivational interviewing fit into the format of the second intake session with your patient?

- ___ 1= Not Well
- ___ 2= Not Very Well
- ___ 3= Fairly Well
- ___ 4= Mostly Well
- ___ 5= Very Well



Rena “Liz” Courtney, M.A., graduated from the University of Virginia in 2012 with a Bachelor’s Degree in Psychology is currently enrolled as a Clinical Psychology PhD student at Gallaudet University. She obtained her Master’s Degree in October 2016 from Gallaudet University in Psychology. Mrs. Courtney is interested in research concerning the mind-body connection that occurs during exercise, as well as how exercise can be used to recover from trauma-related illnesses, particularly PTSD. For 2.5 years, she was employed at the Washington DC VA Medical Center as a clinical psychology extern in the Mental Health Clinic and Trauma Services Program, as well as a research assistant to the Integrative Health and Wellness (IHW) Program that provides complementary and integrative health (CIH) services to Veterans. She is currently a clinical psychology extern at the Salem VA Medical Center, providing evidence-based therapy for Veterans with PTSD and other trauma-related disorders.

TORCH Infections: A Review of Current Research and Implications for Psychologists

Garry Wright, M.A.

Department of Psychology

TORCH infections are a group of infections that are of particular concern for pregnant women as they have been shown to impact the developing fetus, resulting in a wide range of physical and neurological sequelae. These infections include Toxoplasmosis, Other infections (e.g., syphilis and varicella zoster virus), Rubella, Cytomegalovirus, and Herpes simplex virus. Sequelae associated with TORCH infections include, but are not limited to, disruption in fetal brain development, prematurity, sensorineural hearing loss, ocular dysfunction, jaundice, and seizure disorder. Behavioral concerns in children exposed to these infections in utero have also been documented. The purpose of the current manuscript is to provide epidemiological information on TORCH infections as well as associated physical, neurological, and behavioral manifestations for psychologist working with children and their parents who have been impacted by these infections.

Keywords: TORCH, infection, neurology, congenital, development

Humans are bombarded with a host of viruses and bacteria on a daily basis. In immunocompetent individuals, infections of these organisms may cause mild symptoms such as fever, congestion, gastrointestinal distress or may produce no symptoms at all. However, in certain populations such as individuals with acquired immunodeficiency disease (AIDS) and infants where the immune system is compromised or underdeveloped, the impact of infection is often greater.

Pregnant women are another vulnerable group to infection because of the risk of transmitting the infection to the fetus transplacentally. A group of infections known as TORCH infections are of particular concern to the fetus because of their documented effect on fetal development (Stegmann & Carey, 2002). TORCH is a medical acronym referring to a group of congenitally or neonatally acquired infections that has the potential to cause significant mortality and morbidity in infants (Del Pizzo, 2011). These infections include Toxoplasmosis, Other infections (e.g., syphilis and varicella zoster virus), Rubella, Cytomegalovirus, and Herpes simplex virus. Current epidemiological information is reported in the current manuscript, as well as physical, neurological, and behavioral manifestations associated with TORCH infections. Additionally, implications for psychologists working

with children and their parents who have been impacted by these infections are also included.

Toxoplasmosis

Toxoplasmosis is a disease caused by the protozoan parasite *Toxoplasma gondii* (Jones, Lopez, Wilson, Schulkin, & Gibbs, 2001). People are infected with the parasite by eating undercooked and contaminated meat or water, ingesting the parasite after handling contaminated meat, and coming into contact with the parasite through contaminated cat feces (Del Pizzo, 2011). The Center for Disease Control (2015b) estimates approximately 22.5% of the population 12 years and older in the United States has been infected with *Toxoplasma* and the incidence is often higher in other parts of the world. Individuals with healthy immune systems often do not have symptoms if infected with the parasite. If symptoms do appear they are often flu-like and mild and last for a brief period of a couple weeks (Center for Disease Control [CDC], 2015b).

Pregnant women can pass the infection to their unborn child should they become infected during pregnancy. It is rare that women who were infected before conception transmit the infection to the fetus because of the mother's developed immunity, although fetal transmission due to reactivation of *Toxoplasma* has been documented (Brown, Chau, Atashband, Westerberg, & Kozak,

2009; CDC, 2015b). The risk of transmitting the infection across the placenta increases with gestational age. During the first semester the risk of transmission is 10% to 25% and increases to an estimated 60% to 90% during the third semester (Brown et al., 2009; Jones et al., 2001). As with many congenital infections, the earlier the infection of *Toxoplasma* the more severe sequelae at birth (Del Pizzo, 2011).

Physical manifestations and a variety of sequelae involving the central nervous system (CNS) are often seen with first and second trimester congenital infection. In particular, *Toxoplasma* infection before twenty weeks of gestation is associated with the classical triad of symptoms which include hydrocephalus, intracranial calcifications, and chorioretinitis (Jones et al., 2001). Chorioretinitis, which is inflammation of the choroid and retina of the eye, develops in up to 90% of infants if not treated (Brown et al., 2009). Furthermore, chorioretinitis may lead to microphthalmia-related blindness (Nickerson et al., 2012).

In addition to ophthalmologic and visual problem, other toxoplasmosis-associated physical symptoms include jaundice, hepatosplenomegaly, lymphadenopathy, anemia, and thrombocytopenia (CDC, 2015b; Del Pizzo, 2011). Physical symptoms tend to be transient and can be corrected with medical intervention. CNS-involved symptoms often associated with first and second trimester infection include microcephaly, developmental delay, cognitive impairment, hydrocephaly, sensorineural hearing loss (SNHL), seizures, and neuronal migration disorders (Brown et al., 2009; Del Pizzo, 2011).

Infants infected during the third trimester are often asymptomatic at birth. An estimated 75-90% of newborns infected in utero do not present symptoms at birth (Brown et al., 2009; Jones et al., 2001; Wilson, Remington, Stagno, & Reynolds, 1980). This high number of asymptomatic births is due to the increased likelihood of transmitting the infection later in gestation. Although later infection of the fetus is associated with a decreased risk of clinical symptoms at birth, asymptomatic infants are at risk of developing chorioretinitis later in life (Brown et al., 2009).

Many neuroanatomical structures may be affected with *Toxoplasma* infection. *Toxoplasma* can cause necrosis or lesions to the spinal cord, brainstem, cerebellum, and cerebrum. Calcification,

which is associated with first and second trimester infection, is usually located in the cerebral cortex, basal ganglia, and near the ventricles (Nickerson et al., 2012). Motor problems and cerebellar dysfunction may not be initially seen at birth but develop later (Jones et al., 2001).

Prevalence of toxoplasmosis associated SNHL range from 0% to 28% (Andrade et al., 2008; Brown et al., 2009; McLeod et al., 2006). A study by Brown et al. (2009) followed children with congenital toxoplasmosis infection and found no incidence of progressive or delayed hearing loss. The range of prevalence and development of SNHL appears to be dependent upon treatment. Twenty-eight percent of children who received limited or no antiparasitic treatment, 12% of children who received treatment after 2.5 months of age, and 0% of children who received treatment before 2.5 months developed SNHL.

Wilson et al. (1980) examined children with congenital toxoplasmosis who were asymptomatic at birth. One group of children ($n=13$) were diagnosed prospectively because antibodies were present in the umbilical cord and the other group ($n=11$) showed symptoms after the newborn period. Eighty-five percent of children in the first group developed chorioretinitis compared to 100% in the second group. Three children in the first group had unilateral blindness, whereas eight children in the other group developed unilateral or bilateral blindness. Three children in the first group had SNHL compared to two children in the other group. In the first group five children developed neurological sequelae. Specifically, one child develop major sequelae (e.g., microcephaly, seizure disorder) and four developed mild sequelae (delayed psychomotor development and mild cerebellar dysfunction). In the second group five children developed major neurological sequelae including seizure disorder, micro- and hydrocephaly, and severe psychomotor retardation, and three had minor sequelae, which included minor cerebellar dysfunction). Two children from both groups developed intellectual disability. It was noted in the sample that neurologically sequelae was always associated with ophthalmological problems. Finally, of the 16 children whose brains were radiographically examined, intracranial calcification was present in five of them.

Syphilis

Syphilis is caused by the *Treponema pallidum* spirochete and is spread through sexual contact with an infected individual or coming into

contact with a lesion containing the spirochete (CDC, 2015a). In addition to sexual contact, an infected mother can transmit syphilis to her unborn child (Del Pizzo, 2011). Over 6,000 cases of congenital syphilis were reported between 1999 and 2013 (Su et al., 2015). The rate of congenital syphilis has varied in the past 15 years in the U.S. There was a decline in congenital syphilis between 1991 and 2005 and then a slight increase from 2005 to 2008 was observed. The rate then decreased from 2008 to 2012, and between 2012 and 2014 a steady increase was reported (CDC, 2015a).

A range of multi-organ physical and neurological sequelae are associated with early and late congenital syphilis. Early congenital syphilis refers to symptoms that appear before age two, often between one to two months of age. The majority of infants are asymptomatic at birth (Del Pizzo, 2011). Maculopapular skin rash may develop soon after birth. Neonates may also develop syphilitic rhinitis, sometimes referred to as snuffles, in which the nose is chronically congested and runny. The mucus may contain *Treponema pallidum* and be highly infectious. Lymphadenopathy, acute meningitis, pneumonia alba, thrombocytopenia (~30%), anemia, hepatosplenomegaly (50-90%), and chorioretinitis are other symptoms frequently noted with early congenital syphilis (CDC, 2015a; Del Pizzo, 2011; Phiske, 2014; Woods, 2009). Approximately 70-80% of children develop skeletal problems as newborns, including bone lesions and osteochondritis (Nickerson et al., 2012; Phiske, 2014; Rasool & Govender, 1989).

Overt symptoms that present themselves after two years, known as late congenital syphilis, include dental abnormalities. These abnormalities include Hutchinson teeth, which are characterized by small teeth with abnormal grooves, hard palate perforation, and protrusions located on molar teeth called mulberry molars (CDC, 2015a; Del Pizzo, 2011; Phiske, 2014). Sensory organ related damage includes interstitial keratitis and eighth nerve deafness. Periostitis, which can lead to saber shin, and pseudoparalysis have also been documented (Nickerson et al., 2012). Additional symptoms include nephrotic syndrome, pancreatitis, and gastrointestinal obstruction and inflammation (Del Pizzo, 2011; Woods, 2009).

Neurosyphilis may result from untreated syphilis in neonates. Inflammation of the arachnoid and pia mater, known as leptomeningitis, and hydrocephalus are often signs of neurosyphilitic infection (Phiske, 2014). Cerebral infarctions and cranial nerve palsies have also been associated with

neurological involvement of congenital syphilis (Del Pizzo, 2011; Phiske, 2014).

Mortality, prematurity, and intrauterine growth restriction are major concerns of congenital infection of syphilis. Su et al. (2015) reviewed the 6,383 reported cases of congenital syphilis between 1999 and 2013. The mortality rate, defined as death up to twelve months after delivery, was 6.5% and was similar to the mortality rate of 6.4% between 1992 and 1998. Approximately 82% of the mortalities were stillbirths. Increased risk of death was associated with birth weight below 1,500 grams (i.e., very low birth weight) and birth before 28 weeks of gestation. Thirty-four percent of the children that died had either radiographic or physical evidence of congenital syphilis. Over half of the children who survived had no apparent evidence of infection.

Varicella Zoster Virus

Varicella zoster virus (VZV) is a member of the *Herpesviridae* family. A primary infection of VZV leads to varicella, also known as chickenpox. A secondary infection due to reactivation causes herpes zoster, known as shingles (Del Pizzo, 2011). Reactivation occurs because VZV, like other herpesviruses, establishes latency in the body, specifically the dorsal root ganglia (Gershon et al., 2012). VZV is spread through contact with infected fluids, including respiratory secretions through airborne contact (CDC, 2011). VZV infection across the placenta can result in congenital infection. The risk of transmission to the fetus is rare, with a reported transmission rate of 0.4-2%. The risk of transmission increases with time of infection during gestation, with lower incidence (0.4%) occurring with maternal infection before week 12 of pregnancy and higher incidence (2%) occurring when the mother was infected between 13th and 20th week of pregnancy (Enright & Prober, 2004; Ramachandra, Metta, Haneef, & Kodali, 2010). If neonates are infected between five days before birth and two days after (i.e., perinatal infection), they may present as asymptomatic but have a risk of developing zoster later in life (Del Pizzo, 2011).

The vast majority of congenital VZV cases (~90%) occurs as a result of maternal varicella infection, indicating primary infection, within the first 20 weeks of gestation (Del Pizzo, 2011; Nickerson et al., 2012). Less than 10% of cases result from maternal herpes zoster, indicating secondary infection. Since varicella is primarily responsible for fetal infection of VZV, disorders and abnormalities resulting from infection are referred to

as congenital varicella syndrome (CVS; Del Pizzo, 2011).

A number of gestational issues are associated with CVS, including low birth weight and spontaneous abortions, which occur in 3-8% of fetuses following a maternal infection during the first trimester. Mortality rate for infected perinatally is approximately 30% (Enright & Prober, 2004). The most common physical sequelae reported with congenital VZV infection are cutaneous lesions (~70%) and limb hypoplasia (50-80%; Enright & Prober, 2004; Gershon & Silverstein, 2009). Limb paresis is also a common manifestation in approximately 65% of infected neonates. A variety of ocular sequela has been documented in approximately 66% of congenitally infected children (Gershon & Silverstein, 2009). These eye-related pathologies include optic nerve atrophy, Horner's syndrome, cataracts, chorioretinitis, and microphthalmia. Gastrointestinal (e.g., gastroesophageal reflux) and genitourinary abnormalities (e.g., hydronephrosis and cryptorchidism), as well as poor sphincter control (~32%) are other physical manifestations (Enright & Prober, 2004; Gershon & Silverstein, 2009; Ramachandra et al., 2010).

Nearly half (~46%) of children with CVS have neurological abnormalities (Enright & Prober, 2004). These abnormalities include neuronal migration disorders (e.g., polymicrogyria), micro- and hydrocephaly, cerebellar hypoplasia, and encephalitis. Additionally, nearly 35% of children present with some type of cortical atrophy. CNS involvement results in children who may present with seizures, developmental delay, and intellectual disability (~18%; Enright & Prober, 2004; Nickerson et al., 2012).

Rubella

Rubella, also known as German measles or three-day measles, is probably the most well-known of TORCH infections because of the rubella epidemic in the U.S. between 1964 and 1965. Although a strong vaccination program has nearly eradicated rubella in the U.S., it is still endemic in many parts of the world (Papania et al., 2014). Rubella is spread through respiratory secretions and transplacentally. Often, individuals who are infected with rubella are asymptomatic. If individuals do experience symptoms, they usually experience rash, low fever, and aching joints (CDC, 2014).

Rubella becomes problematic when infection occurs during pregnancy, as it is associated

with severe birth defects and fetal mortality. More than 80% of transplacental transmission occurs during the first trimester (Neu, Duchon, & Zachariah, 2015). Congenital rubella infection can result in stillbirth, miscarriage, and congenital rubella syndrome (CSR; Del Pizzo, 2011). Defects and handicaps associated with CSR involve a wide range of organs and neurological functioning.

Dermal erythropoiesis is a hallmark of congenital rubella infection in which the newborn presents with blue spots on the skin resembling the appearance of a blueberry muffin (Del Pizzo, 2011; Neu et al., 2015). Nearly 40% of infected newborns are born with intrauterine growth restriction and failure to thrive (Vernon, Grieve, & Shaver, 1980). The most common complication associated with CSR is hearing loss. More than 70% of newborns have some degree of hearing loss, which is usually sensorineural, bilateral, and stable (Menser & Reye, 1974; Neu et al., 2015; Vernon et al., 1980). Ocular difficulties are other sensory-related defects of rubella with an estimated 33% of children experiencing problems with vision (Menser & Reye, 1974). Children may develop microphthalmia, cataracts (50-78%), glaucoma (~4%), and pigmentary retinopathy (Neu et al., 2015; Vernon et al., 1980).

Nearly 60% of neonates with CSR experience problems with their hearts (Del Pizzo, 2001; Neu et al., 2015; Vernon et al., 1980). Cardiac manifestations include peripheral pulmonary stenosis, patent ductus arteriosus, and ventricular septal defect (~18%; Vernon et al., 1980). Other organ and cellular involvement includes interstitial pneumonitis, thrombocytopenia, lymphadenopathy, and hepatosplenomegaly. Diabetes mellitus affects between 15% and 40% of infected neonates (Neu et al., 2015; Vernon et al., 1980). Additional endocrine problems such as hypothyroidism and Grave's disease are not uncommon with CSR. Urogenital complications such as urethral defects, hernias, and cryptorchidism, affect more than half of children with congenital rubella infection (Vernon et al., 1980).

Complications with the CNS may accompany physical handicaps in congenitally infected youth. Children may be delayed in reaching their developmental milestones and an estimated 42% may develop an intellectual disability (Vernon & Hicks, 1980). Children may also suffer from encephalitis which can cause vasomotor instability (affecting body temperature regulation), seizures, muscular hypotonia, and lethargy. Furthermore, infected children show radiographic evidence of neuronal migration disorders, subcortical

hypodensities, cerebellar hypoplasia, and calcification periventricularly and within the basal ganglia (Nickerson et al., 2012). Behavior disorders that may accompany congenital rubella are autism (~7.4%), hyperactivity, impulsivity, perseveration, and difficulty shifting attention (Chess, 1977; Chess & Fernandez, 1980). Learning disabilities and aphasia have also been documented (Vernon et al., 1980).

Cytomegalovirus

Cytomegalovirus (CMV) is a member of the *Herpesviridae* family. It is the most common congenital infection in the U.S. The virus gets its name from its large appearance, "cyto" meaning cell and "megalo" meaning large. A common virus, CMV symptoms are often not present in individuals with healthy immune systems (Kenneson & Cannon, 2007).

CMV is transmitted from person to person through contact with infected body fluids and can be vertically transmitted from mother to fetus if the woman has an active infection during pregnancy (Coll et al., 2009). Mothers who experience a primary infection during pregnancy have a greater chance of transmitting CMV to the fetus (~32%) compared to mothers who experience a secondary infection (1.4%; Kenneson & Cannon, 2007). Prevalence rates suggest that 20,000-40,000 infants are born with CMV annually (Demmler, 1991; Ross & Boppana, 2005) and approximately 400 of these cases are fatal (Cannon & Davis, 2005).

Common sequelae associated with congenital CMV infection are SNHL, cerebral palsy, seizures, jaundice, intrauterine growth retardation, thrombocytopenia, chorioretinitis, hepatosplenomegaly, petechiae, and intellectual disability (Andriessse, Weersink, & de Boer, 2006; Bale, Blackman, & Sato, 1990; Dreher et al., 2014; Fowler et al., 1992; Gabrielli et al., 2012).

Approximately 10-15% of newborns infected congenitally with CMV will have clinically apparent symptoms or abnormalities at birth (Boppana, Pass, Britt, Stagno, & Alford, 1992; Dreher et al., 2014). The majority of symptomatic infants (~60%) will experience significant and often permanent neurological sequelae (Gabrielli et al., 2012). Symptoms associated with the reticuloendothelial system (e.g., anemia, jaundice, and HSM) tend to be transient, whereas abnormalities involving the CNS such as microcephaly, SNHL, and seizures usually persist throughout the lifespan (Cheeran et al., 2009).

The most common structural brain abnormality associated with symptomatic congenital CMV infection is intracranial calcification with an incidence rate of 77% in those with abnormal neuroradiologic scans (Boppana et al., 1997). Other abnormalities include lissencephaly, cortical malformations, cerebral atrophy, microcephaly, ventriculomegaly, and various brain and white matter lesions and cysts (Boppana et al., 1997; Cheeran et al., 2009; Conboy et al., 1987; Noyola et al., 2001). These abnormalities are associated with poor neurological outcomes, including motor impairments, developmental delays, and intellectual disability (Fink, Thapa, Ishak, & Pruthi, 2010; Manara et al., 2011; Noyola et al., 2001). A study by Noyola et al. (2001) showed that 54% of children with symptomatic CMV infection attained an intelligence quotient (IQ) of >70 and only 29% attained an IQ of >90. It is estimated that 7,000-8,000 children each year will develop some permanent neurological sequelae as a result of congenital CMV (Cheeran, Lokensgard, & Schleiss, 2009; Demmler, 1991; Madden et al., 2005).

Roughly 90% of infected infants show no apparent symptoms at birth (Coll et al., 2009). However, an estimated 5 to 15% will eventually develop CMV-related sequelae, the most common being SNHL (Fowler et al., 1992; Nance, Lim, & Dodson, 2006). The onset of sequelae can occur months or even years after birth (Fowler, Dahle, Boppana, & Pass, 1999).

SNHL is the most frequent sequela associated with congenital CMV infection (Royackers, Christian, Frans, & Ermelinde, 2011). SNHL is so common that congenital CMV is currently the leading nonhereditary cause of SNHL in the U.S. (Demmler, 1991; Fowler et al., 1999; Madden et al., 2005; Nance et al., 2006; Ogawa et al., 2007). Among children in the U.S., congenital CMV is responsible for approximately 12% to 25% of SNHL (Barbi et al., 2003; Dollard, Grosse, & Ross, 2007; Nance et al., 2006). Prevalence of SNHL in children with congenital CMV in the U.S. range from as low as 9% to as high as 25% (Dahle et al., 2000; Nance et al., 2006; Yamamoto et al., 2011). Children who are symptomatic at birth are significantly more likely to develop SNHL (30-65%) and develop it at an earlier age than those who are asymptomatic (~20%; Dahle et al., 2000; Foulon et al., 2008; Fowler et al., 1997; Rivera et al., 2002; Ross et al., 2006).

Herpes Simplex Virus

Herpes simplex virus (HSV) 1 and 2 are members of the *Herpesviridae* family (Del Pizzo, 2001). HSV is the second most common TORCH infection but unlike other TORCH infections it does not strictly infect congenitally (Nickerson et al., 2012). Up to 2,200 neonates are infected with HSV every year in the U.S., and of those, approximately 85% are infected after coming into contact with infected vaginal secretions or genital lesions through the vaginal canal during birth. Ten percent of infants are infected after birth when exposed to infected secretions, for example if an infected caregiver kisses the infant. Congenital infection with HSV is rare with an incidence of approximately 5% (Enright & Prober, 2004).

Congenital and perinatal infections present a classic triad of symptoms indicating HSV disease. The triad of symptoms includes skin, eye, and mouth (SEM), disseminated, and CNS disease (Del Pizzo, 2011). SEM disease affects nearly 45% of infants with HSV disease (Enright & Prober, 2004). Vesicular skin lesions and scarring, aplasia cutis congenita, and hyper- and hypopigmentation are seen with skin and mouth involvement. Eye-related symptoms include microphthalmia, conjunctivitis, chorioretinitis, and atrophy of the optic nerve (Del Pizzo, 2011; Enright & Prober, 2004).

Roughly a quarter of infants experiencing HSV disease will have disseminated symptomology (Enright & Prober, 2004). Disseminated disease refers to widespread disease that affects multiple organs. Liver (e.g., hepatitis), lung (e.g., pneumonia), adrenals, blood (e.g., coagulopathy), and the gastrointestinal tract have been documented to be affected by HSV (Enright & Prober, 2004; Kimberlin et al., 2001; Nickerson et al., 2012).

An estimated 60-75% of infants with congenital or perinatal HSV infection disseminated disease also have CNS involvement (Kimberlin et al., 2001; Thompson & Whitley, 2011). CNS involvement occurs in approximately 30% of neonates with HSV disease (Enright & Prober, 2004). Radiological scans of infected neonates show evidence of intracranial calcifications, encephalitis, subependymal cysts, microcephaly, and hydranencephaly. Periventricular white matter may also be affected (Nickerson et al., 2012). Nonspecific symptoms of CNS involvement include seizures, temperature instability, irritability, poor feeding, and lethargy (Enright & Prober, 2004). In a study by Enright and Prober (2004), seizures, as well as vesicular skin lesions, were found to be the most common symptoms of infant HSV infection.

Furthermore, the majority (60-70%) of neonates with CNS disease also have vesicular skin lesions. Symptoms of CNS disease tend to appear in the second or third week of life, compared to SEM and disseminated disease appearing around 10-12 days after birth (Kimberlin et al., 2001).

Implications

TORCH infections have a wide-range and often devastating impact on fetal development. These impacts can have life-long consequences on the lives of the infected children, as well as on the lives of the parents and family members who care for these children. Psychologists working with this specialized population should not only be familiar with the current medical research but also be aware of how physical and neurological impairments may impact psychosocial functioning of child and parent. Specific areas of clinical importance are included below.

Children exposed to TORCH infections in utero may have a number of medical complications affecting organs and life-sustaining functions requiring extensive and often on-going medical interventions. In addition to providing services to these children, psychologists should also provide support for parents as they process the stressors of caring for a medically complex child. It may also be beneficial for psychologists to educate parents about possible consequences of the infection, as well as having a discussion regarding the child's quality of life and ways of improving it.

In addition to providing support for parents, it is also important for psychologists to address and monitor the development of the child. As a result of physical or brain injury, children may be delayed in reaching developmental and adaptive milestones. In these cases, children would benefit from behavioral interventions targeted at sleep hygiene, feeding/eating, gross and fine motor, and social/emotional functioning. Additionally, referrals may need to be given for speech and language pathologists, occupational therapists, and physical therapists, for specialized services.

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Match(Brain).Com: A Review of the Neurochemical Foundations for the Behaviors Associated With Lust, Attraction, and Attachment

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The concepts of sex and relationships are among some of the most discussed and researched topics in psychology. Perhaps this is because these concepts come with complex theories and drive a large portion of human behavior. Still, while scientists discuss complex patterns of behavior, categorize relationship types, and explore the seemingly endless bounds of sexuality, the processes that underline these discussions are quite simple. For example, the concepts of sex and relationships can be simplified into three distinct stages: lust, attraction, and attachment. While there is always room for philosophical debate, breaking sex and relationships into lust, attraction, and attachment make intangible concepts tangible. Furthermore, this perspective allows for additional exploration into the biological processes underlining complex sexual behavior. This article pulls from ecological, behavioral, philosophical, neurochemical, and clinical fields in an effort to expose the connection between simple ecological and neurochemical patterns, and more complex human behavior such as sex and relationships. Specifically, the article reviews the biological behaviors and reasons, as well as the neurochemicals associated with lust, attraction, and attachment. Additional clinical and social applications are also discussed for each stage.

Keywords: lust, attraction, attachment, neurochemistry, ecology, clinical psychology, behavioral application

Evolutionary Model of Reproduction

Evolutionary models of reproduction fundamentally attribute the entire process of searching for, selecting, and copulating with a mate on the basis of transferring genetic information into offspring, and ensuring that their offspring will survive to reproductive age (Gonzaga, 2006). The general purpose is to ensure that the organism's deoxyribonucleic acid (DNA) is passed onto offspring and that the offspring make it to an age where they will perpetuate this cycle. This is not to say, however, that mating is random and a matter of first come first mate. Instead, ecological models have found that across species, the reproductive process can be characterized by three behaviorally distinct stages. One such model is proposed by Fisher, Aron, Mashek, Li, and Brown (2002), who splits the reproductive processes into three separate steps for humans: lust, attraction, and attachment. Fisher et al. (2002) provides qualitative descriptions of each stage through explanations of the types of behavior observed. Furthermore, the model expands on the general ecological viewpoint of mating, and postulates that there are neurochemical correlates associated each of the three stages. Moreover, clinical and social applications of this model become available with the integration of the biological reasons for each stage, the behaviors associated with each stage, and the neurochemical foundation for these behaviors.

Lust

Biological Reason and Associated Behavior

Humans have a biological libidinal urge that encourages, and sometimes pushes, individuals into the first step of the reproductive processes. This biological need for sexual gratification perpetuates the need to explore our environment for a potential mate. As a result, lust acts as the catalyst for organisms to start seeking out a mate, and to have sex in order to pass on their DNA. Without this natural drive to have sex, it is questionable if reproduction would even occur. Thus, libidinal drive, similar to thirst and hunger, is an instinctual push to explore the environment to relieve sexual tension and ensure the survival of the species (Reeve & Reeve, 2001).

Specific to humans, there are distinct behavioral patterns that are observed with lust. Fisher (2000) found that the first common behavior is the self-report of a libidinal urge. This urge initiates the entire mating processes by strongly pushing an individual to start searching for a mate. Second, is a craving for sexual gratification; not only do individuals have a drive to have sex an individual wants to relieve this tension. Finally, as expected, the last behavior attributed to this stage is the actual act of having sex. For example, take any college student with a strong libidinal urge who decides to attend a party with the intention of "hooking-up". If such a

drive did not exist, it is possible that the organisms would not even bother to start the searching process. In turn, the organism would never go through attraction or attachment to then pass on their DNA. Interestingly, Fisher et al. (2002) suggests that these behaviors are strongly correlated to specific neurochemical levels.

Neurochemicals of Lust

The brain is the control center for behavior and therefore, it is not shocking to speculate that there are distinct patterns in neurological chemistry that correlates to specific behaviors. In this instance, fMRI measures have shown that androgens, specifically increased levels of testosterone and estrogen, are the primary neurochemicals driving this stage (Fisher, 2000). For example, after giving an injection of testosterone, male sparrows were more likely to abandon their mated partners in search for another mate (Wingfield, 1994). Similarly, Booth and Dabbs (1993) conducted a study looking at men with elevated levels of testosterone. Results indicated that men with high testosterone baselines married less frequently, became more abusive, and were more likely to divorce. Additionally, when relationships become unstable, Booth and Dabbs (1993) found that male testosterone levels increase. In combination, all of these studies show a strong case for the impact increased levels of testosterone has on lustful behavior.

The second chemical that also appears to be a key to lustful behavior is estrogen. In short, Lobo, Rosen, Yang, Block, and Van Der Hoop (2003) identified that while testosterone levels are critical in sex drive, this drive is mediated by estrogen. Results showed that regardless of the level of testosterone, without the presence of estrogen, libidinal urge does not increase. Thus, it appears that testosterone only has its effect on sex drive when estrogen is present. When looking at the chemical synthesis of both testosterone and estrogen, it is apparent that testosterone is a precursor to the formation of estrogen. Therefore, because estrogen is produced later in the chemical synthesis, the regulatory effect it has on a preceding chemical (testosterone) is not surprising. Such findings provide a strong base for both clinical and social applications.

Clinical and Social Applications

Clinically, understanding how these chemicals function provides an explanation of maladaptive behaviors. For example, hypoactive and hyperactive sexuality disorders should be viewed not only as a social or personality distortion but also as potential signals of low or high levels of testosterone

and estrogen. High levels of testosterone could explain hyper sexuality, while low levels of testosterone or estrogen may explain hyposexual behaviors. Neurochemical levels may also explain why females become nymphomaniacs (obsessed with sex, but not necessarily engaging in sex) and the males have satyriasis. With the roots in the biological drive and need for sex.

Non-clinical applications of these hormonal functions could explain many social behaviors. To start, heightened levels of testosterone in men and women could result in cheating, such as with the sparrows. Additionally, social influences such as marital or relationship instability cause the human brain to naturally increase testosterone levels. This could be a biological signal that this relationship is not functional and to find a different partner. Heightened levels of testosterone could also explain why individuals in long-term marriages begin to lose sexual drive as other neurochemicals increase. Alternatively, a decrease in the levels of testosterone and estrogen, may explain why women report low libidinal urges during pregnancy. Interestingly, Blum (1997) found that male testosterone levels plunge as soon as their baby is born. Again, this indicates that different chemicals are functioning at reproductive stages.

Attraction

Biological Reason and Associated Behavior

Ecological explanations for attraction relate primarily to conservation of energy and the principles of natural selection. Having the libidinal urge to seek out a mate, the attraction stage includes behaviors that promote the selection of a mate, with the purpose of reproduction. The advantages of this stage are conserving the organism's energy (which would otherwise be wasted in multiple copulations), ensuring the best/healthiest mate, and focusing attention to one individual. Behaviors attributed to this stage include increased energy and attention toward a particular individual, feelings of excitement, and cravings of emotional union. Additional behaviors include intrusive thoughts of the partner and physiological changes such as increased heart rate, sweating, increased galvanic activity, and respiration. As with lust, Fisher et al., (2002) identified several neurochemicals related with this stage of a relationship.

Neurochemicals of Attraction

There are also several neurochemicals guiding attraction. The first is dopamine, a neurotransmitter related with attraction as well as the

neurological reinforcement of the behavior. Kiyatkin (1995) found an increased level of dopamine in the central nervous system is associated with novel environments and helps focus attention. Typically, two individuals starting a relationship find themselves in new experiences and environments because of their potential mate's interests. Dopamine increases may also result in this heightened attention to one specific person. Therefore, dopamine produces physiological and cognitive changes associated with the reward system in the brain. The reward system and the dopamine pathway include the frontal lobe (which controls the integration of life experiences as well as executive functioning) and the limbic system (emotional regulation and processing). Through these pathways, dopamine reinforces the emotional connections and feelings a person has toward their external world. Dopamine often causes feelings of euphoria, loss of appetite, hyperactivity, increased mental activity, and decreased fear, anxiety, and need for sleep, (Drevets et al., 2011; Fisher, 1998). In the context of relationships, these pathways are natural reinforcement for engaging and interacting with potential mate as opposed to others. Lastly, Martin-Soelch et al., (2001) found delaying reinforcement causes the brain to natural increase production of dopamine. This delay accounts for infatuation and addiction to their potential mate.

Norepinephrine and serotonin are the second neurotransmitters associated with the attraction phase. As a precursor to epinephrine and a derivative of dopamine, norepinephrine accounts for most of the physiological changes that take place during attraction. Heightened levels of norepinephrine result in increased energy, excitement, euphoria, sleeplessness, and giddiness. Griffin and Tayler (1995) also showed increased norepinephrine is associated with increased memory for new stimuli. In a relationship, the partner is most likely a novel stimulus; thus, increased levels of norepinephrine may account for why individuals are able to recall specific details of a partner.

Serotonin is the final neurotransmitter that appears to be activated during the attraction stage. While there is a paucity of research looking at the role of serotonin specific to attraction and interpersonal relationships, Flament, Rapoport, and Bert (1985) have used selective serotonin reuptake inhibitors to stop obsessions. Therefore, Fisher (1998) extrapolated low levels of serotonin may cause obsessive thinking about one's partner, and the intrusive thoughts, corresponding to behaviors during attraction. When looking at the neurological pathway for serotonin we see a larger cortical influence than

compared to norepinephrine or dopamine. This larger influence could support that serotonin interrelates other sensations/behaviors (i.e. visual information, kinesthetic information, language, memory, and unconscious physiological responses) to our experiences. From this connection, future research should explore the function of serotonin within the context of social behavior.

Clinical and Social Applications

The clinical applications for the neurochemistry related to the attraction stage range from anxiety to abuse. For example, the reinforcement of being around someone may attribute to separation anxiety, dependency, and stalking behaviors due to neurochemical reinforcement provided when a person is with a loved one. Similarly, the increased levels of norepinephrine and serotonin attributed to memory of details and obsessive thinking could promote obsessions over people and fetishes.

The patterns observed between neurotransmitter functioning and behavior could explain several implications related to relationships. For example, dopamine, a natural reinforcer, explains the emotional dependency, jealousy, fear of rejection, and possessiveness observed in some relationships. Similarly, depression and anxiety are especially pervasive emotions evoked after unruly breakups or during troubling times in a relationship. Though these are just extrapolations from behavior and research, future research should actively investigate these connections. Results would produce better interventions and strategies for relationships in turmoil.

Attachment

Biological Reason and Associated Behavior

Attachment is said to be the last stage in the reproductive stages and relationships from an evolutionary viewpoint. Primarily, the behaviors associated with attachment are grounded in ensuring offspring will be born and will survive until they come to reproductive age. As mammalian offspring take longer to come to an age of independence, evolution needed a way to keep two organisms together for an extended period of time (Fisher, 2000). Consequently, the male often watches over the pregnant female, and both watch over the offspring.

Specific behaviors associated with this stage center around three main goals, security, proximity, and emotional unity (Fisher, 2000). With security, mammalian females commonly become slower tired

and vulnerable to predators. To ensure offspring are born and reach reproductive age, males tend to stand guard and protect females during pregnancy. Similarly, long-term stress and physical labor call for behaviors and activities that promote calming and health. Fortunately, nature has produced two natural neurochemicals that help facilitate all of the above.

Neurochemicals of Attachment

There are two primary neurotransmitters associated with attachment behavior, oxytocin and vasopressin. Research has shown after sexual orgasm, for both men and women, the brain natural floods the cortex with oxytocin and vasopressin (Schiml & Rissman, 200; Ogawa, Kudo, Kitsunai, & Fukuchi, 1980; Carterr, 1992). Ross, and Young, (2009) found oxytocin is also released with close proximity to people and when individuals are touched. While Ross and Young (2000) found a behavioral impact on neurochemistry, Walum et al. (2008) found that the presence of vasopressin receptors promote attachment behavior revealing a neurochemical impact on behavior. Consequently, these studies reveal that oxytocin and vasopressin promote the need for organisms to be close to one another.

Additionally, there is a significant correlation with oxytocin, stress, and wellbeing. Uvnas-Moberg and Petersson (2005) found evidence supporting increased levels of oxytocin reduced stress, promoted wellbeing, increased social interaction, and helped with growth and healing. Furthermore, these behaviors of unity, proximity, and protection are opposite to the behaviors observed during lust. Therefore, the opposition within the neurochemistry is consistent with disrupting these behaviors. In fact, research has shown increased levels of oxytocin actually decrease levels of testosterone (Ziegler, 2000). Similarly, individuals in long-term relationships, after establishing attachment, start to experience a decrease in sexual drive. This is not shocking given their behaviors are now correlating to oxytocin (attachment, support, proximity) which decreases testosterone (sex drive and lustful behavior). Such postulations are further supported by the aforementioned research demonstrating pregnant women have high oxytocin levels and men have lower testosterone levels as soon as their child is born. As with the other stages, understanding this information provides both clinical and social applications.

Clinical and Social Applications

There are a couple of clinical applications for understanding the neurochemistry of attachment. First, understanding the oxytocin helps promote proximity. Therefore, attachment anxiety, abandonment issues, and relationship dependency is likely correlated with oxytocin levels (Costa et al., 2009). These applications are very similar to those found in the attraction stage; however during the attachment phase, the amount of time needed for oxytocin and vasopressin to become the dominate chemicals determines the severity of symptoms. Secondly, Van Londen et al., (1998) reported oxytocin results in the reduction of depression symptoms. Given oxytocin promotes unity and social behavior, the neurochemical was provided to individuals with major depressive disorder (MDD). Results indicated oxytocin was effective in reducing symptoms and promoting socialization of those with the diagnosis of MDD.

Knowing the effects oxytocin and vasopressin have on behavior could explain some common social behaviors observed in attached relationships. For example, the fear of isolation and loneliness could be stemming from the production of oxytocin and vasopressin in the central nervous system. Moreover, understanding how oxytocin and vasopressin promote unity and the need to be around someone, could start to make the argument that humans are neurologically programmed to be monogamous. This argument only strengthens with the combined efforts of dopamine in the central nervous system and the natural reinforcement of attraction behavior.

Conclusion and Future Research

The evolutionary model of relationships splits the processes into three distinct stages, lust, attraction, and attachment. Each stage has their own associated behaviors associated, and in turn, research has shown each stage may be driven by particular neurochemicals produced at higher rates during each of these three stages of a relationship. The first stage, lust, appears to be driven by testosterone and estrogen, utilized to produce the libidinal urges that make an organism start the processes of finding a mate. Attraction, driven by dopamine, norepinephrine and serotonin, establishes the infatuation and obsession related to picking one mate from the many. Finally, attachment is fueled by oxytocin and vasopressin, which programs individuals to want to stay close, emotional, and attached in order to reproduce and ensure the safety of the offspring.

Future Research

One of the largest critiques to the neurochemical foundations of a relationship is the balance and interaction of all of the neurochemicals. Across these stages, each chemical is present. Therefore, future research should review the interaction of these chemicals in relation to reproduction. It is possible with this information, research may stumble on a clearer explanation and mechanisms for the behaviors discussed. Secondly, while these behaviors certainly explain heterosexual relationships (the sole purpose of these behaviors is for reproducing), it is not clear how these models account for the same behaviors presented in homosexuals or various sexualities. Finally, future research should explore how long each stage is. Do the stages have a critical period, can one stage be drawn out longer if needed, or is there an average length of time to go from lust to attachment? Future research should continue to explore these questions, and perhaps shine some more light onto a subject that fascinates nearly everyone.

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Audism: A Review

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Audism refers to the oppression deaf and hard-of-hearing individuals experience from the hearing world and is based on the belief that ability to hear makes one superior. This paper reviews the theory behind audism, its history, and impact. The psychological impact of Audist micro-aggressions towards deaf and hard-of-hearing individuals is briefly reviewed. Criticism towards the term audism and potential resolutions to issue of audism are discussed, as well as future considerations for professional working with deaf and hard-of-hearing individuals.

Keywords: Audism, Micro-aggressions, Hearing Loss, Hard-of-Hearing, and Deaf

Minority individuals such as deaf and hard-of-hearing individuals experience oppression and discrimination on a daily basis (Bauman, 2004). Despite the passing of the Americans with Disabilities Act (ADA) in 1990, deaf, hard-of-hearing, and late-deafened individuals continue to experience oppression and discrimination by the hearing world (Sue, 2010a). According to Bauman (2004), deaf individuals are discriminated against and are rarely treated with the rights and dignity that they deserve. Similar to other marginalized groups, deaf, hard-of-hearing, and late-deafened individuals experience micro-aggressions (Sue, 2010a). More specifically, these micro-aggressions take the form of small subtle everyday verbal or nonverbal denigrating remarks towards deaf individuals. These may be committed consciously or unconsciously.

Literature Review

Audism is a term first coined by Tom Humphries in 1975 in an unpublished essay (Ballenger, 2004; Bauman, 2004). According to Humphries, audism refers to “the notion that one is superior based on one’s ability to hear or behave in the manner of one who hears” (as cited in Bauman, 2004, p. 240). Audism involves the discrimination, prejudice, and oppression of deaf individuals based on one’s hearing ability. This includes the audist beliefs, attitudes, and behaviors of individuals who perceive hearing individuals as superior to deaf individuals (Bauman, 2004). Audism explains the oppression and stigma experienced by deaf, hard-of-hearing, and late-deafened individuals from the majority of the hearing or speaking world and unifies these experiences under a single concept.

Despite the term being composed more than 30 years ago, audism is still a relatively new term (Bauman, 2004). This is due to the fact that there is an absence of research papers on audism published outside of deaf journals (Eckert & Rowley, 2013). Sadly, some dictionaries do not even include this important term (Bauman, 2004).

A Theory of Audism

The theory behind audism is the belief that hearing individuals are the standard prototypical humans (Hauser et al., 2010). Audism exists around the belief that the success and happiness of deaf and hard-of-hearing individuals relies on their ability to learn oral language and engage in hearing world standards (Bauman, 2004). Society has long been operating on the definition of language as an oral one. In other words, language has been defined by one’s ability to produce speech. This inaccurate and incomplete definition of language has negative implications, as “the concept of what it means to be human becomes intimately tied with speech” (Bauman, 2004, p. 242). There is an assumption that sound is an integral and inherent part of language.

Audism can be expressed in one of three ways: Overt audism, covert audism, and aversive audism (Eckert & Rowley, 2013). Overt audism occurs when an individual from the majority hearing population does not see, understand, nor take into account the impact of audist attitudes, assumptions, privileges, and beliefs. This is similar to that of dominant or overt racism, as there is no fear of individuals or institutions imposing consequences for such behaviors (Eckert & Rowley, 2013). Covert audism,

on the other hand, is not as readily clear, as it is hidden. At times, it may even occur in disguise. Aversive audism relates to avoidance and is characterized by denial.

Psychological Impact

Deaf, hard-of-hearing, and late-deafened individuals are frequently faced with audist attitudes, behaviors, and opinions from the hearing population who are in the majority (Bauman, 2004). Minority groups, such as deaf and hard-of-hearing individuals, who do not fit into the majority view of ‘normal’ often experience oppression and discrimination in the form of micro-aggressions. Micro-aggressions are slight verbal or non-verbal insults or negative derogatory messages aimed at minority individuals on a daily basis (Sue, 2010a). These micro-aggressions are in addition to everyday life stressors experienced by everyone. Micro-aggressions have the potential for serious psychosocial impact on the well-being of individuals (Sue, 2010a). These micro-aggressions can impact emotional functioning and have the potential to cause frustration, anger, and shame for the individual on the receiving end (Sue, 2010). Hence, it is important to take micro-aggressions into account when working with deaf, hard-of-hearing, and late-deafened individuals. Table 1 (see below) shows examples of audist micro-aggressions in everyday settings with cultural diverse deaf and hard-of-hearing individuals, as well as the various themes that micro-aggressions fall under (Sue, Capodilupo, Torino, Bucceri, Holder, Nadal & Esquilin, 2007).

Table 1
Examples of daily micro-aggressions against culturally diverse deaf and hard-of-hearing individuals.

Theme	Micro-aggression Example	Message
Denial or Minimization of audist experience	After informing a friend about feelings of frustration over an incident of audism at work, the friend responds by stating “Oh come on, don’t make a big deal it was nothing”	You are making a big deal out of nothing. I don’t care about your experience.

Infantilization	After finding out that a person is hard-of-hearing (HOH), a neighbor starts talking to the HOH individual like a child: “How are YOU (pointing fingers) feeling?”	You are not capable of doing anything on your own. You need help and guidance.
Disregarding deaf communication need	When a deaf individual informs a sales person that he is deaf and to write the information on a paper, the sales person responds by pointing to her own mouth indicating that the deaf individual should read her lips.	I don’t care about your struggle. You need to adapt to dominate hearing culture by lip-reading.
Rejection of Identity	A father say to his deaf son, “don’t say you are deaf, say you cannot hear well.”	Being deaf is negatively perceived in society, or you don’t fit my description of deaf.
Deny individual right to privacy	A deaf individual is asked straightforwardly how she lost her hearing.	You have to explain yourself. This kind of information is not privileged.
Patronizing	After learning that a deaf individual is a doctoral level student, a person responds with surprise and comments on how she is a role model for others.	Deaf people are not expected to succeed.

Pathologizing	On adjustment to late-deafness, someone comments “Wow you can adapt to change! I could never do that.”	Having a disability or deafness is awful, I cannot survive it.
Second Class Citizen	A deaf individual with cochlear implant waits an additional 30-minutes behind security check for pat down, while others behind who are able to go through metal screening march past her despite availability of officers.	You don’t have equal rights or your rights to same speed of service are not important to us.
Spread Effect	Someone makes an insensitive remark about disability issues	Something is wrong with you, or your deafness invalidates you in many ways

Table themes are taken from Sue et al. (2007).

According to Erickson, et al. (2010), discrimination and harassment towards minority individuals have been shown to cause stress, health-related problems, and psychological injury. Similarly, Sue (2010a) stated, “it is well documented that overt and obvious forms of discrimination such as racism detrimentally impact the mental and physical health, quality of life, self-esteem, and identity of nearly all marginalized groups in society” (p. 87). Thus, there is an urgent need for counselors to address and acknowledge these issues when working with deaf, hard-of-hearing, and late-deafened clients.

Moreover, how society views and interacts with deaf and hard-of-hearing individuals impacts their behaviors, attitudes, and education (Hauser, O’Hearn, McKee, Steider & Thew, 2010). Deaf individuals’ perception and knowledge about how they should live varies depending on whether or not they were raised by deaf parents or hearing parents (Hauser et al., 2010). When deaf children interact with deaf

individuals, it has a positive impact on their readiness for school as well as education and learning.

Criticism

Some critics have targeted the term audism. Some critics “object to the term or play to audism’s political dimensions, criticizing it as a political necessity for the deaf community or mark of ingratitude in deaf people’s notion that has done much for them” (Ballenger, 2013, p. 122). Such critics have also argued that audism allows for exclusionary boundaries (Eckert & Rowley, 2013). However, these critics have ignored the micro-aggressions have led to such exclusions (Eckert & Rowley, 2013).

Nevertheless, audism remains a daily reality for many deaf and hard-of-hearing individuals (Ballenger, 2013). These experiences are very real, as there are a wide number of individuals with hearing loss experiencing society’s audist attitudes and behaviors. Ballenger (2013) acknowledges that the existence of audism, the associated negative stigma, and the urgent need to address these issues. Despite increased education about micro-aggressions and audism towards deaf, hard-of-hearing, and late-deafened individuals, this type of discrimination, prejudice, and bias continues to be experienced.

Discussion

Audism is the individual, institutional, and systematic oppression of deaf, hard-of-hearing, and late-deafened individuals (Eckert & Rowley, 2013). Audism can take many forms and is often illustrated in the treatment and interventions linked to psychology of deficit (Hauser et al., 2010). This oppression, discrimination, and bias of individuals with hearing loss by the hearing-abled population is a daily reality for most if not all deaf, hard-of-hearing, and late-deafened individuals. Despite its criticism, audism is nevertheless a real and widely experienced reality for individuals with hearing loss. It is important to note that audism is not limited to deaf signers, but all individuals with hearing loss, including those who utilize assistive listening devices and biotechnology (Hauser et al., 2010).

Medical and academic institutions need to be aware of audist practices and take into account the individual needs of the deaf children. It is important to accept deafness as a rich culture, unique with its own language, set of rules, values, and principles. Rather than focus solely on correcting hearing loss, these institutions need to refocus their efforts on

promoting the well-being and health of deaf, hard-of-hearing, and late-deafened individuals (Hauser et al., 2010).

Potential Resolutions

There are a number of potential resolutions to help reduce and eliminate audism. A crucial step in eliminating audism is expanding public awareness of audism through increased education. Given that research on audism is generally only found within deaf journals, it is recommended that deaf individuals' contributions to society be accessible to everyone (Eckert & Rowley, 2013). This can be done by inclusion of audism-related studies outside deaf journals and through increased education of the public regarding audism towards deaf, hard-of-hearing, and late-deafened individuals. By unmasking the reality of audism, it then becomes a more visible social problem (Eckert & Rowley, 2013). By increasing public awareness of these issues, medical and educational professionals can better collaborate with one another for a best child approach (Hauser et al., 2010). It is also important that researchers taken into account potential biases towards deaf and hard-of-hearing individuals (Hauser et al., 2010).

It is important for educators to provide equal access to information to students with hearing loss and become aware of typical pitfalls in terms of deaf education. There is an illusion that providing deaf and hard-of-hearing individuals with an interpreter in mental health and educational settings means inclusion (Glickman, 2003; Hauser et al., 2010). The same can be said for Real Time Captioning services. For example, rather than primarily relying on the sign language interpreter for interpreting an in class video, the professional should look for videos that are closed captioned, or make an effort to have someone caption the video in advance. Additionally, many educators falsely believe that if a student can lip-read, it implies full access to information. Research indicates that speech reading alone accounts for less than 50% of understanding (Hauser et al., 2010). Another common myth is the belief that laws in place for discrimination and equal access imply accessibility. It is important for educators to take into account audism, whether intentional or unintentional. Educators should also consult with experienced educators and deaf professionals who are knowledgeable in working with individuals with hearing loss to look for potential discriminatory or exclusionary activities. (Hauser et al., 2010). It is crucial for professionals to examine their own biases and potential audist attitudes and how that may influence their work (Hauser et al., 2010).

Future Work with Deaf Individuals

In terms of future work with deaf individuals, it is important to remember that discrimination and audism happen daily in a variety of forms. Counselors should allow for a safe environment in which individuals can openly discuss their experiences. Counselors should acknowledge that audism does, in fact, happen and that it is not acceptable. It is also important to understand and investigate the psychosocial impact of such experiences. For example, deaf individuals exposed to audism may experience pain, anger, and possible shame.

Counselors need to take utmost care in respecting and understanding the unique experiences of deaf clients and how audism may impact their psychosocial functioning. In addition to establishing rapport, counselors should work on empowering clients, providing resources to help them overcome their negative experiences, and reminding them that they are not alone and that there are laws to protect them (e.g., American with Disabilities Act).

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Editors-in-Chief



Gregory Farber, B.S., is a fourth-year deaf Clinical Psychology PhD student at Gallaudet University. Previously, Greg attended Rochester Institute of Technology where he obtained a Bachelor of Science degree in Psychology. His own experiences of deafness and his observation of frustrations and struggles of his deaf peers led him to become fascinated with impact of life experiences on one's development and with psychology in general. Greg knew there is no better place to pursue his dream than Gallaudet University, the cultural mecca for the Deaf community. He remains true to his first psychological interest and his research interests are still closely related with areas of D/deafness, development of D/deaf individuals, and the Deaf community. In the future, Greg hopes to become a Clinical Psychologist serving Deaf community and a professor of psychology. He also hopes to specialize in Developmental Neuropsychology. While in Gallaudet, Greg noticed that the majority of studies and research that his fellow students conduct remain unknown. This observation brought him to the idea of reactivation of the Gallaudet Chronicles of Psychology, a journal where Gallaudet students could publish their findings. As a co-Editor, Greg has two goals - promoting psychological research related to disability and deafness and helping his fellow graduate students to share their works with the rest of the D/deaf community.



Joanna Dziura is a fifth-year Clinical Psychology PhD student at Gallaudet University. Previously, Joanna attended Wroclaw University in Poland, where she obtained a Master of Arts degree in Psychology. Right after graduation, Joanna joined the Polish Army and served for 8 years as a uniformed military psychologist in engineering and armor units. During that time, she was deployed multiple times to Iraq and Afghanistan, where she provided psychological help to soldiers from 18 different nations and multinational civilian contractors. Joanna also served as the Chief of Humanitarian Assistance Coordination Center, where she was assessing the critical needs of local Iraqi institutions and organized financial and material humanitarian help for hospitals, schools, and Non-governmental organizations (NGO). During the time she spent in Iraq and Afghanistan and through work with the civilian population in these countries, Joanna had a chance to observe first-hand the impact that disability had on people's lives. This experience resulted in a strong desire to understand this topic better and specialize in the psychology of health and illness. Currently, her main area of research interest is the late acquisition of visible and hidden physical disabilities in civilian and military populations. Joanna wrote chapters to three books dedicated to military psychology and presented multiple times at professional conferences delivering lectures on pre-deployment psychological preparation of military personnel, PTSD, deployment stress, and issues related to the late acquisition of disability. Joanna also deeply believes that the road to being a great professional starts early in a student's education and requires being actively involved in students' affairs.

Faculty Editorial Supervisor



Dr. Lori Day, Ph.D., received her Ph.D. in Clinical Psychology from Gallaudet University. She completed her internship through the Child and Family track at Baylor College of Medicine in Houston, Texas. She went on to complete her post-doctoral training in Pediatric Neuropsychology at The Kennedy Krieger Institute/Johns Hopkins Medical School. She has been a faculty member in the Clinical Psychology Graduate Program since 2012. Dr. Day's responsibilities include teaching, research, supervision, and mentoring of graduate students. Her current research includes: the adaption of Parent-Child Interaction Therapy (PCIT) to make it accessible for deaf individuals, adaptations of psychological measures for deaf individuals, and the development of a technology based literacy program for deaf students. Additionally, Dr. Day provides behavioral parent training and neuropsychological assessment in private practice, is a reviewer for *The Journal of Deaf Studies and Deaf Education*, is the Faculty Editorial Supervisor for the *Gallaudet Chronicles of Psychology*, and has been a statistical consultant for various research projects.

