

Late-Onset Sex Offending and the Assessment of Behavioral Variant Frontotemporal Dementia (bvFTD)

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Behavioral variant frontotemporal dementia (bvFTD) is a common neuropsychiatric disorder, which is often missed or misdiagnosed by both neurologists and psychiatrists as a cause of emotional and behavioral problems. Inappropriate emotional responses and maladaptive behavior, including criminal behaviors, may be the first obvious expression of bvFTD caused by altered moral feelings, loss of empathy, disinhibition, and compulsive behavior. New onset sex offenses, including indecent exposure, sexually inappropriate comments, and unwanted sexual advances have been documented in early bvFTD. These behaviors may escalate with progressive disease and lead to harsh penalties. The presence of inappropriate sexual behaviors in older individuals with no prior history should raise concern about the presence of bvFTD in forensic examinations. In addition to the forensic examination, diagnostic evaluation requires psychological testing (including tests of social and affective cognition) and imaging studies. In sex offenders, a diagnosis of bvFTD has significant implications for risk assessments, requirements regarding supervision and management, and as evidence for mitigation. In this article, we review the neuropsychiatry of bvFTD, how the pathophysiology may contribute to sex offenses, and important psycholegal considerations for the forensic psychiatrist when evaluating bvFTD.

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Early onset dementia is frequently misdiagnosed and misunderstood by clinicians, including both psychiatrists and neurologists.¹ Frontotemporal dementia (FTD) specifically accounts for 20 percent of early-onset dementias, yet remains poorly recognized.² While the clinical importance of making an appropriate diagnosis should not be understated, recognizing FTD has important implications in the legal arena as well.

Behavioral variant frontotemporal dementia (bvFTD) is the dementia most likely to be associated with increased sexual activity.³ While most subjects with bvFTD display decreased sexual interest and behavior, a significant minority (8–18%) show an increased sexual interest. Sexual misbehaviors, including indecent exposure, inappropriate sexual comments, and unwanted sexual advances, are increasingly identified in patients with bvFTD compared with other neurodegenerative conditions.⁴ Behaviors span the spectrum from inappropriate verbalizations to overt sexual assault.⁵

Unlike better recognized forms of dementia, such as Alzheimer's, individuals with bvFTD may experience dramatic changes in personality, mood, and behavior without any obvious cognitive impairment.⁶ Behavioral changes may present long before other symptoms, and criminal behavior may be the first sign of bvFTD.^{7,8} Because of the lack of cognitive complaints and poor insight, caregivers and primary doctors often suggest patients with undiagnosed

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early bvFTD seek psychiatric consultation for problematic behaviors.⁹

These behaviors may lead to allegations of civil wrongdoing or criminal charges. Sexual offending is often associated with a psychiatric condition, such as personality disorders, psychosis, mania, PTSD, developmental and cognitive disorders, and most importantly, paraphilias. But sexual offending may be volitional, situational, and opportunistic, and a significant minority of sex offenders do not have a diagnosable paraphilia.^{10,11} As sentencing for criminal sexual offending becomes increasingly harsh, forensic psychiatric evaluations must differentiate between those with a sexual psychopathology versus those purely engaging in unlawful behavior.

Evaluators should be familiar with the assessment and evaluation of new-onset inappropriate sexual behavior in older persons. Frequently, these changes are assumed to be psychiatric in origin without further evaluation. It is important to consider neurological and cognitive causes of offending that is out of character, suddenly occurring in mid to late life, and associated with other personality, mood, and behavioral changes.

This article provides guidance for the forensic psychiatrist on the impact of bvFTD in sexual offending, including assessment and diagnosis, as well as its implications for the court and legal system. Though forensic psychiatrists must consider bvFTD, they should simultaneously pursue appropriate assessment, diagnosis, and treatment recommendations of other conditions, including common conditions like paraphilias.

Frontotemporal Dementia

Frontotemporal lobar degeneration (FTLD) is a clinically, neuroanatomically, and pathologically heterogeneous group of neurodegenerative diseases that affects the frontal and temporal lobes of the brain. The frontal lobe of the brain is associated with processes such as restraint, planning, initiative, empathy, and language production, while the temporal lobe is associated with emotion processing, memory, face and object identification, and language identification.^{12,13} Behavioral variant frontotemporal dementia (bvFTD), the most common subtype of FTLD accounting for nearly 60 percent of all cases, presents with progressive decline in emotional reactivity, interpersonal skills, and executive functioning.¹⁴ Patients with bvFTD are more likely than those with any other type of dementia to receive an incorrect

psychiatric diagnosis of major depressive disorder or bipolar disorder.^{15,16} This frequently delays the correct diagnosis of bvFTD by many years.¹⁷

Diagnosing bvFTD

In 2011, an international consortium of experts proposed and validated revised criteria for the diagnosis of bvFTD. To meet the diagnostic criteria for possible bvFTD, a patient must have the persistent presence of three or more of the following behavioral and cognitive symptoms:¹⁸

- Early (within the first three years of onset) behavioral disinhibition
- Early apathy or inertia
- Early loss of sympathy or empathy
- Early perseverative, stereotyped, or compulsive or ritualistic behavior
- Hyperorality and dietary changes
- A neuropsychological profile consistent with executive deficits with a relative sparing of memory and visuospatial functions (Ref. 18, Table 3, p 2460)

Probable bvFTD may be diagnosed with these symptoms in the presence of imaging consistent with changes such as frontal or anterior temporal atrophy on an MRI or CT or frontal or anterior temporal hypoperfusion or hypometabolism on PET imaging. Expected neuroimaging abnormalities help to improve the confidence of diagnoses by moving it from the “possible” to the “probable” category.²

In bvFTD, MRI may show pronounced gray matter atrophy in the frontal lobes, the insula, and the anterior cingulate cortex.¹⁹ FDG-PET improves accuracy of diagnosis of bvFTD when compared with MRI.²⁰ Brain imaging is also essential to exclude other pathology such as infarction, tumors, abscess, or trauma. Neuroimaging is not diagnostic of bvFTD, however. In fact, imaging is often normal in early disease and late disease only shows focal atrophy in about half of patients.²¹ Though not diagnostic, positive neuroimaging moves the diagnosis of bvFTD from “possible” to “probable.” This is not only important for diagnostic accuracy but may be significant in the courtroom where the forensic psychiatrist must give an opinion with a reasonable degree of medical certainty.

A definite diagnosis of bvFTD is made when the above criteria exist in the presence of histopathological evidence of FTLD on biopsy or postmortem examination or a known pathogenic mutation. Frontotemporal

dementias are highly heritable with up to 40 percent being familial. An estimated 15 to 40 percent of cases are due to single-gene mutations.²² BvFTD is the most heritable of the frontotemporal dementias. Between 30 and 50 percent of bvFTD patients have a positive family history, with an autosomal dominant mode of inheritance in 10 to 27 percent of cases.²³ Genetic testing can be helpful in the forensic diagnostic workup, given that about 15 percent of cases are caused by recognized genetic mutation.²⁴ BvFTD is associated most commonly with known mutations in the microtubule-associated protein tau (MAPT), progranulin (GRN), and C9ORF72 genes, which may result in an autosomal dominant inheritance pattern observed in 10 to 25 percent of patients.^{25–27} C9ORF72 represents the most common genetic etiology, found in over 30 percent of familial bvFTD cases.²⁸

DSM-5 also includes diagnostic criteria for bvFTD.²⁹ The cognitive-behavioral symptoms are largely the same as the above criteria. One significant difference is that bvFTD requires “prominent decline in social cognition and/or executive abilities” in addition to three or more of the behavioral symptoms (Ref. 29, p 614).

Other symptoms that should at least arouse one’s suspicion of a diagnosis of bvFTD include word-finding difficulties, visuospatial dysfunction, the presence of frontal release signs, extrapyramidal symptoms, hallucinations, delusions, and hyperorality (such as binge-eating, new onset smoking or alcohol consumption, and mouthing of inedible items). Classically, symptoms may appear in the presence of preserved visuospatial motor skills and minimal episodic memory loss.^{18,27} Given these spared abilities, bvFTD subjects can often continue to function in demanding careers without coming to the attention of medical professionals.

The DAPHNE screening tool was developed to efficiently screen for bvFTD by assessing behavior in multiple domains (disinhibition, apathy, loss of empathy or lack of social awareness, perseverations, hyperorality, and neglect).³⁰ The scale has a high sensitivity for detecting bvFTD and positive screens may be followed with a 40-question diagnostic scale with significantly greater specificity.³⁰

Routine neuropsychological tests for frontal lobe functions assess executive functions, working memory, and complex attention processes. Impaired social cognition is the hallmark of bvFTD. Neuropsychological

tests to assess social cognition mediated by ventromedial prefrontal cortex include false belief tasks, *faux pas* tests, and strange stories test.³¹ The Iowa Gambling Task may help pick up on deficits in emotional and social processing that led to offensive behavior. Tests of emotion recognition, including those using video assessment instead of just assessing emotions of photographs, adds validity to the diagnosis of bvFTD.³² Forensic psychiatrists without training in advanced neuropsychological tests will benefit from working with a neuropsychologist for the assessment of cognitive impairments and capacities related to bvFTD.

Neuroscience of Frontal Lobe Disinhibition

Intrinsic connectivity networks (ICNs) are cortical brain networks that exist both during a resting state or during a task.³³ Multiple large-scale brain ICNs are involved in bvFTD: the central executive network (CEN), the salience network (SN), and the default mode network (DMN).³⁴ Studies have shown that the anterior insular cortex (AIC) and anterior cingulate cortex (ACC) have a role in adjusting the mind to social contexts.³⁵ Functional MRI studies have placed the AIC and ACC within the SN.³⁶ Neurodegenerative changes to structures that form the salience network are linked to loss of empathy in bvFTD.³⁷ Social error detection, theory of mind, and risk prediction are subserved by the salience network and impaired in bvFTD.³⁸

Enhanced desire is associated with different patterns of neural responses in the dorsal anterior cingulate-ventral striatal-amygdala functional network.³⁹ This network was not associated with a greater degree of liking sexual behaviors. The dissociation between networks responsible for liking sexual behaviors and desiring them has been described by incentive motivation theories which suggest an aberrant motivation for a sexual cue even without needing the hedonic tone.³⁹ Age-related maturation of frontocortical gray matter involved in executive control often results in less compulsive sexual behaviors as a person ages. Adolescents, in contrast, demonstrate greater ventral striatal activity relative to prefrontal cortical activity, which contributes to a relatively limited ability to monitor or inhibit behaviors in relation to sexually explicit cues.³⁹ These findings are consistent with increased difficulty in inhibiting inappropriate sexual behaviors in those with frontal lobe impairment due to bvFTD.

Lack of empathy has been associated with damage to the anterior insula, as well as disease of the right medial orbitofrontal cortex (OFC).⁶ The OFC has been conceptualized as a relay station helping to modify behavior in accordance with perceived reward and punishment.⁴⁰ Right OFC neurodegeneration seen in bvFTD is associated with poor reward and punishment processing, ultimately resulting in behavioral disinhibition, including hugging or kissing strangers, urinating in public, performing inappropriate sexual acts, and telling offensive jokes.⁴¹

Impairments in Theory of Mind

Theory of mind (ToM) refers to the ability to infer other people's mental states, thoughts, and feelings. The ability to make inferences about others' mental state is essential for humans to engage in complex social interaction.⁴² This is a key aspect of social cognition which may be impaired in conditions such as autism spectrum disorders and psychopathy. It is also implicated in bvFTD. Research suggests that ToM impairments are independent from executive functioning in bvFTD.⁴³ ToM deficits in bvFTD are characterized by misinterpreting mental states and concrete thinking. These deficits are related to disease severity and are associated with distinct areas of prefrontal atrophy.⁴⁴

Social inappropriateness is frequently the first clinical sign of bvFTD, often seen years before any noticeable impairment on classical neuropsychological assessments or imaging.⁴⁵ Patients with bvFTD score significantly lower on tests of basic emotion recognition compared with a normalized sample.⁴⁶ They have impairments on tests of ToM (which include first-order false belief, second order false belief, *faux pas* detection, and Reading the Mind in the Eyes) while having no difficulty in general tests of comprehension and memory. Deficits may not be seen on simple ToM tests but become noticeable with more developmentally advanced tests.⁴² For example, one study showed that basic social norms such as fairness may be preserved in bvFTD while complex behaviors such as prosociality and punishment were impaired, suggesting that the integration of social contextual information is uniquely impaired in bvFTD.⁴⁷

Developing Sexual Disinhibition

A neurobiological understanding of how bvFTD results in unwanted sexual behaviors is not well established. Neuroscience has improved understanding of

brain networks that contribute to behavior regulation, however. Neurodegenerative diseases affect executive function, social emotional processing, and self-awareness, which can result in inappropriate sexual behaviors and violence. Hypersexual states and reduced empathy may further contribute to offensive behaviors in bvFTD as opposed to Alzheimer's.

Sexual drive and behaviors, including offending, generally diminish with age, and bvFTD is more commonly associated with hyposexuality, likely resulting from degeneration of neural circuits involved in reward, empathy, emotional processing, and autonomic functioning.⁴⁸ In a small subset of patients exhibiting hypersexual and inappropriate sexual behavior, however, bvFTD may be uniquely associated with hypersexuality.⁴⁹ Compared with patients with Alzheimer's dementia, bvFTD patients show an increase in sexual desire, including seeking sexual stimulation, widening sexual interests, and experiencing arousal from previously unexciting stimuli.⁴⁹ The right temporolimbic area is likely an affected region for increased sexual arousal in bvFTD, with heightened or altered sexual behavior particularly likely in the right temporal variant of bvFTD.^{50,51} Increased sex drive in bvFTD may also be due to a failure of satiety mechanisms normally governed by the OFC and amygdala.³

Additionally, the diminished ToM present in patients with bvFTD likely has a large role in new onset sexual offending. Older first-time child exploitation material (pornography) offenders show higher degrees of impairment in decision-making and in facial emotional recognition.⁵² This may suggest that older offenders lack empathy and demonstrate difficulty perceiving the mental states of others. Patients with bvFTD seem to understand legal and societal rules yet display a diminished emotional concern for consequences. That is, there is a disconnect between the knowledge of the criminal acts and any concern for avoiding them.

Sex Offending and bvFTD

Sexually inappropriate behavior exists on a spectrum which includes excessive pornography use, inappropriate comments, exposure, and grabbing, along with more serious offending behavior. Older offenders are more likely to engage in passive sexual offending and forcible fondling versus forcible rape with attempted penetration.⁵³ Older offenders are more likely to commit nonviolent sex offenses such

as improperly touching an acquaintance, statutory rape, exposing genitals to minors, and exhibitionism.⁵⁴ They are more likely to target children than younger sex offenders.⁵⁵

Many older sex offenders are first-time offenders and the potential explanations for new onset behavior are broader than those typically considered for adolescent and younger adult first-time offenders (mainly paraphilias). This assumes the behavior truly started later in life. When concluding someone is a first-time offender, it is important to assess for historical offenses or behaviors that may have been unreported or not come to the attention of law enforcement. Additionally, diagnostic considerations are different for late life onset of behavior compared with a later in life arrest for a historical offense.

Paraphilias typically develop during adolescence with behavior beginning in early adulthood. In contrast, sexually deviant behavior presenting for the first time in the elderly is outside of the natural history of a paraphilic disorder.⁵⁶ While not explanatory for all incidents of sexual crime in the elderly, the onset of these behaviors later in life has a clear link with dementia processes. In one study of older criminals who underwent psychiatric evaluations, having dementia and being charged with a sexual offense were the most typical factors associated with older offenders.⁵⁷ Fazel and colleagues found that sexual offenses by elderly men are more likely to be related to personality factors than acute mental illness, potentially suggesting the missed presence of neuropsychopathology that leads to personality changes, such as bvFTD.⁵⁶

The presence of bvFTD is associated with sexual crimes. In the Liljgren study, 8.19 percent of the criminal behaviors committed by patients with bvFTD were sexual advances, compared with only 0.37 percent of the crimes in Alzheimer's disease. Public urination, which can result in a sex offense charge depending on the circumstances, accounted for 4.09 percent of the criminal behavior in bvFTD whereas it only accounted for 0.18 percent of cases in Alzheimer's disease.⁸ In a more recent study, Swedish patients with postmortem confirmation of bvFTD were much more likely to have engaged in criminal behavior during the course of their illness. Sexual offenses in this population ranged from clear sexual abuse to sexual harassment and public masturbation, sometimes directed toward young children. Almost half of the bvFTD patients exhibiting criminal behavior did so for the first time during the first half of their disease course.⁵⁸

Multiple cases have described the onset of pedophilic behavior related to bvFTD. Mendez discusses a case of a 60-year-old former professor with new onset pedophilic behaviors. The patient met diagnostic criteria for frontotemporal dementia and had a prominent area of focal hypometabolism in his right temporal lobe on positron emission tomography (PET).⁵⁰ Raneiro described a case of late onset heterophilic pedophilia. During work-up, the man was diagnosed with frontotemporal dementia associated with a mutation in the progranulin gene.⁵⁹ Mendez also presented a series of cases where pedophilia and sexual harassment developed in patients with bvFTD. These patients presented with decreased moral judgment, a lack of empathy, and disinhibited drives.⁶⁰

BvFTD in the Courtroom

Sexually inappropriate behaviors become legal matters when they become sex crimes. A sex crime is a sexual offense against a nonconsenting adult, child, or animal usually for the purpose of sexual gratification. These include contact offenses (such as rape or child molestation) as well as noncontact offenses (such as exhibitionism and voyeurism). Sex offender forensic evaluations are often required prior to conviction since crimes with a sexual motivation carry more stringent consequences. Sex offender evaluations are required as part of postsentencing civil commitments under sexually violent predator (SVP) laws. Typically, the parties involved (the court and lawyers) request clarification about risk, requirements for supervision, management recommendations, and evidence for mitigation. Courts are also interested in diagnosis and treatment recommendations for the offender. These evaluations require a behavioral analysis, diagnostic formulation, risk assessment, and treatment recommendations. Civil damages may be sought in cases of sexual harassment and abuse even when the behavior does not amount to a crime. Though much of the law continues to develop and remains unsettled, bvFTD has relevant implications in numerous sex offense related settings. The following discussion reviews some areas where the diagnosis of bvFTD and its symptoms have legal relevance.

Competency to Stand Trial

Though an analysis of competency to stand trial (CST) does not directly involve sexual offending, it does provide an opportunity to understand how

courts may understand bvFTD. Though not involving sexual offenses, a decision by the Ninth Circuit Court of Appeals offers some insight into how courts might interpret behavioral manifestations of bvFTD. In *United States v. Dreyer*,⁶¹ a defendant was diagnosed with bvFTD, manifested by changes in behavior, personality, impaired social interactions, disinhibition, a loss of insight, and a loss of impulse control.⁶¹ The district court convicted him of conspiracy to distribute controlled substances and sentenced him to ten years in prison. The appeals court held that the diagnosis of bvFTD and its accompanying symptoms sufficed to cause a genuine doubt as to the defendant's competency, and described bvFTD as a diagnosis "of a mental disorder affecting the defendant's mental condition and behavior" (Ref. 61, pg. 964).

Insanity

Given that the defendant with bvFTD will typically understand the difference between right and wrong, the illness will rarely qualify for an insanity defense. Typically, in the absence of severe, advanced illness, those with bvFTD will know the nature and quality of the act. Additionally, offenders should understand the act is legally wrong, even if they are unconcerned with potential consequences.

Potentially, a defendant with bvFTD might argue the absence of an appreciation of moral wrongfulness, qualifying for an insanity defense in some jurisdictions. That is, offenders may claim they did not morally understand their behavior to be wrong, because of the mental impairment of bvFTD. Current evidence suggests, however, that bvFTD patients perform their antisocial actions in a manner that would make them morally responsible.⁶² Criminal behavior in those with bvFTD aims to fulfill selfish desires (such as sex) without regard for the interest of others, it is not accidental, and it is not based on false beliefs.⁶³

Alternatively, a defendant may pursue an insanity defense in the few states which include a volitional prong. Many people have impulses to engage in immoral behavior but successfully prevent themselves from acting on such impulses. If, however, a person lacks the necessary skills (such as theory of mind, harm aversion, loss aversion, and empathy, among others) to avoid acting on an impulse because of development of the mental disorder bvFTD (rather than innate personality characteristics), the behavior might be considered to the result of an irresistible impulse. When asked if a defendant's behavior was

the result of an irresistible impulse, the evaluator should systematically assess whether the symptoms of bvFTD impaired the capacity to conform the defendant's behavior to the requirements of the law.⁶²

At least one case highlights an attempt to introduce bvFTD as a valid nexus to insanity. In 2006, Nathan Ford was convicted of 53 counts of rape, gross sexual imposition, kidnapping, felonious assault, and aggravated robbery. He initially pled guilty but later appealed, arguing that he was diagnosed with frontotemporal dementia and that the condition caused him to have irresistible impulses. Additionally, he argued he had ineffective counsel because his trial counsel failed to recognize and present frontotemporal dementia as a complete defense. The court upheld the conviction and guilty plea, pointing out that the state did not have a pure irresistible impulse test and nothing in the record indicated the defendant failed to know the wrongfulness of his actions (a necessary condition for an insanity defense in the jurisdiction), and left unanswered the question of whether symptoms of bvFTD may constitute an irresistible impulse rendering one unable to conform behavior to the requirements of the law.⁶⁴

Mens rea Defenses

Unlike the complete defense of insanity, *mens rea* defenses are partial defenses that negate the specific intent of a charged crime. Though definitions are not universally accepted, typically general intent refers to the intent to perform an act while a specific intent requires an extra intent to achieve a specific consequence in addition to the general intent to complete the act.⁶⁵ Successful application usually does not imply exoneration but results in a defendant receiving conviction for a lesser included crime or charge. The concept of being unable to form a specific intent because of one's state of mind at the time of the offense has been described as diminished capacity.

A bvFTD diagnosis seems unlikely to negate the specific intent of most charges. Persons with bvFTD may be indifferent to the consequences, but in general cognition is intact, and they understand the action and the likely result. That is, though they may not have the cognitive ability to fully modulate a behavior, they maintain the specific intent of the behavior. Patients with bvFTD typically are aware of the harmful consequences of their actions.⁶³ It is difficult to argue that the intentions of offenders with

bvFTD do not motivate their behavior, since their behavior aligns with their intentions.⁶² They reason through consequences and wrongfulness of actions but simply do not allow this understanding to influence their behavior.⁵ Though offenders with bvFTD engage in behavior that fulfills their intentions (for example, they engage in sex offenses to find sexual gratification), they may lack the capacity to have morality influence their behavior and may lack the psychological processes necessary for normal moral behavior (such as the ability to empathize when making social decisions).⁶²

It is possible to envision a situation where a person with a highly impaired ToM may not have the specific intent to commit a crime in which offending the victim is an element of the crime (such as exhibitionism). Because of an inability to understand the emotions of others, the offender may not recognize the victim's objection to an action and therefore not recognize the behavior as inappropriate (for example, a man who walks around his front yard nude without considering the reaction and feelings of his neighbors). Thus, when examining someone with bvFTD for a potential *mens rea* defense, the expert should not only focus on the cognitive aspects of specific intent but any emotional or social aspects as well.

We are not familiar with any cases in the United States where bvFTD has been successfully introduced to negate intent, but there is a case in the United Kingdom. After she stabbed her husband of 60 years to death, a woman had her sentence reduced from murder to manslaughter because of her diagnosis of bvFTD. She was ultimately ordered to psychiatric hospitalization after a finding of diminished responsibility.⁶⁶

Importantly, some crimes, such as statutory rape, are deemed strict liability, which by definition do not require intent. If an elderly, first time sex offender committed a strict liability crime such as having sex with a minor, considerations of bvFTD would be irrelevant as a *mens rea* defense would not be possible.

Mitigation and Sentencing

A diagnosis of bvFTD may play an important role in mitigation and sentencing, as it explains deviations from prior law-abiding behavior. Lawyers and experts should consider the potential implications of introducing bvFTD evidence. While identifying a biological mechanism for behavior may be mitigating,

individuals with bvFTD may appear cognitively intact and acknowledge that their behavior is inappropriate while appearing to lack remorse or control. This information has the potential to harm the defendant. Those who complete their sentence may be subject to civil commitment, which can result in a significant loss of freedom. Potentially, someone who brings up bvFTD in mitigation may be considered high risk for re-offending and spend more time civilly committed.

In an administrative hearing in North Carolina, a chief judge was accused of sexual misconduct while on the bench, behavior that was new late in his career.⁶⁷ While he was ultimately censured, no further penalty was imposed in part because he had early-stage frontotemporal dementia, "a disease which can manifest itself through a lack of control of sexual impulses" (Ref. 67, p 445) and a prior history of 18 years of exemplary service without incident. Though not involving a sex offense, frontotemporal dementia has been successfully used for mitigation in murder cases. In a case in Florida, a defendant avoided the death penalty related, in part, to a diagnosis of frontotemporal dementia.⁶⁸ In another case in Australia, the judge found that the defendant had decreased moral culpability because of bvFTD and that, given the defendant's dementia, general and specific deterrence were not relevant concerns for prolonged sentencing.⁶⁹ These cases show the potential for bvFTD to be mitigating when the nature of the disorder is properly related to the behaviors in question and properly explained to the trier of fact.

Ineffective Counsel

New-onset criminal behavior in an adult should prompt a serious investigation of possible changes in mental state, particularly bvFTD. Sfera and colleagues recommend screening all first-time offenders over the age of 55 for bvFTD with neuropsychological testing and possibly PET imaging.³⁸ Sexual offending, especially repeated offending, carries severe punishments, so the identification of bvFTD as a factor in such behavior is important for defense and mitigation.

In one case where an attempt was made to introduce bvFTD, Stanley Sims was convicted of attempting to entice a minor to engage in sexual acts, traveling in interstate commerce for the purpose of engaging in sexual acts with a minor, and transporting child pornography.⁷⁰ He appealed for several reasons, including that he could not sign an FBI Consent to Search form due

in part to “brain deterioration” and frontotemporal dementia (Ref. 70, p 951). Though the U.S. Court of Appeals for the Tenth Circuit did not find evidence of any impairment at the time of the search, they acknowledged that symptoms of bvFTD could ultimately affect a defendant’s judgment.

Rehabilitation and Risk Management

The court has a significant interest in management of defendants with bvFTD given the seriousness and repetitive nature of sex offenses. While the risk of sexual reoffending generally decreases with age, the risk of reoffending due to frontal lobe dysfunction may be considerably higher than predicted with standard assessments.^{71–73} While age is frequently used as a proxy for dementia and disinhibition, it is important to remember that bvFTD may present much earlier than other forms of dementia. Any opinion about a defendant with this disorder should include a risk assessment, treatment options, and guidance on a recommended level of care.

Risk assessments involve an analysis of a combination of static and dynamic factors. The severity of the impact the behavior has on a victim, the likelihood of reoccurrence, and the ability to control behavior in the community each play a role in the legal system’s determination of risk. If someone has bvFTD, risk may be determined in standardized fashion by weighing static, dynamic, and protective factors. But the management and treatment may differ greatly from traditional sex offenders.

A full discussion of the treatment of sex offenders and paraphilias is beyond the focus of this article. It is nonetheless worth reviewing some considerations unique to the treatment of sex offenses caused by bvFTD rather than a paraphilia or other causes. Traditional treatment of sex offenders primarily involves psychological interventions including CBT, relapse prevention, Good Lives, and the Risk-Needs-Response (RNR) model.⁴⁸ These interventions, however, are unlikely to be effective in anyone with a neurodegenerative disorder. The focus for offenders with bvFTD needs to shift to a model of increased supervision, risk containment, monitoring, and placement in a safe environment. This includes environmental and behavioral controls and restricted access to victims. Potential dispositions include enhanced outpatient management, placement in a nursing home, or use of a forensic inpatient or correctional setting.

The U.S. Supreme Court has allowed multiple times for the indefinite civil commitment of people likely to engage in repeated sexual crimes.^{74–76} If someone with bvFTD is unable to be rehabilitated because there is no treatment, placement in a psychiatric hospital for management may be more humane than a prison setting. The development of a special system for offenders with neurodegenerative disorders may allow palliative care of the offender and result in the decongestion of correctional facilities ill-equipped to handle these disorders.³⁸ Such a system of therapeutic jurisprudence better allows the courts to treat defendants with bvFTD with justice while protecting the public from future criminal acts.

Though medications are routinely recommended to treat behavioral symptoms of bvFTD, no large, convincing studies have shown medications to be effective in treating sexual offenses due to bvFTD. Much of the literature on the pharmacological treatment of sex offending focuses on paraphilias rather than dementia. Still, available data from uncontrolled trials, case series, and individual case studies suggests efficacy for commonly used medications in treating sexual behaviors related to dementia.^{77,78}

Serotonergic medications such as SSRIs and TCAs have been effective and are generally recommended as first line treatments for those with sexually inappropriate behavior and cognitive impairment.^{78,79} Anti-androgenic medications, commonly used to treat paraphilias, have also been used successfully to treat dementia related sexual behaviors.⁸⁰ Cyproterone improved compulsive masturbation in a patient with bvFTD.⁸¹ In one report, five men with dementia saw improvements in inappropriate sexual behaviors after treatment with medroxyprogesterone acetate (MPA) though two patients discontinued because of state regulations.⁸² Additionally, at least two case reports saw successful resolution of sexual behaviors due to dementia with the gonadotropin-releasing hormone (GnRh) analog leuprolide.^{83,84}

Treatment of behaviors related to bvFTD remains an active area of investigation. Stimulant medications have been shown in small studies to treat behavioral disinhibition in FTD, with a proposed mechanism of action being increased dopamine transmission between the midbrain and ventral striatum as well as increased activity within the OFC.⁸⁵ Oxytocin has been studied to promote prosocial behavior and counter the lack of empathy that develops with bvFTD.⁸⁵ With the recent breakthroughs in understanding

bvFTD pathology, preliminary pharmacological interventions are being investigated with autoimmune, genetic, and molecular targets.⁸⁶ Nonpharmacological interventions show promise, with transcranial direct current stimulation showing the possibility of enhancing theory of mind in bvFTD patients.⁸⁷ It is necessary to stay up to date on new advances that may treat inappropriate sexual behavior in bvFTD patients to appropriately inform the court of potential interventions.

The potential of treating bvFTD as grounds for a lesser sentence has been addressed by at least one court. In 2006, Eugene Graziano pled guilty to one count of transportation of child pornography. He appealed his sentence on the grounds of a frontotemporal dementia diagnosis and lack of prior criminal history, among other concerns. He argued that expert testimony claimed his bvFTD can be treated with medication which should have led to a lighter sentence. The trial court considered the testimony of expert witness Dr. Robert Bender, who opined bvFTD can be treated with medications. The Court of Appeals upheld the trial court's decision to reject Dr. Bender's medication recommendations given that he was not a psychiatrist or a neurologist and had no experience in treating sex offenders.⁸⁸ We cannot predict how the court would have responded to another witness, but a forensic psychiatrist with experience in bvFTD and the treatment of sex offenders would likely be able to better explain to the court treatment interventions that lower risk of reoffending behavior.

Conclusion

New onset sex offending behavior in an older offender can present a challenge for clinicians and the court system. Neuroscience advancements have provided an understanding of the mechanisms that may contribute to the development of sex offending in people with bvFTD. Changes in neuronal networks leading to increased sexual desire, impairments in Theory of Mind, and a decreased ability to engage in moral decision-making create enhanced potential for unwanted sexual behavior.

Given the significance and frequency of late-onset sex offending, bvFTD must be considered by forensic psychiatric experts. Appropriate diagnosis has ramifications for available defenses, mitigation strategies, risk assessments, and ultimate disposition. It is important to identify any existing neuropsychiatric diagnosis, evaluate risk factors, and consider intent

and arousal, not simply behavior. The examination must assess the volitional and cognitive aspects of the sexual behavior and the extent to which psychiatric conditions contribute. Collateral sources, observations, psychological tests, and medical tests provide evidence of patterns of behavior that may indicate internal factors, such as bvFTD. Unfortunately, this disease is not rare and is the second most common of the dementias. It frequently goes undiagnosed even by experienced specialists. Importantly, expert witnesses should remain vigilant since bvFTD does not present with signs of obvious neurocognitive impairment such as memory loss. Rather, bvFTD can present with personality changes, lack of emotion, and a diminished theory of mind which contribute to engaging in criminal sexual behaviors.

Many courts and legal experts may be unfamiliar with bvFTD, or conflate it with another dementia such as Alzheimer's, so it is incumbent on the expert to understand the details of the diagnosis. An expert should be able to explain neuroscience data, the meaning of brain imaging, the significance of the diagnosis, and the relationship of the illness' symptoms to the specific criminal behavior. Clearly linking behavior to pathology is essential to avoid making claims not supported by science but requires fully understanding the neuroscience in question. Given the rapid development in our understanding of bvFTD, expert witnesses must remain current on the latest science. By considering the important role of bvFTD in new onset sex offenses, forensic psychiatrists can help the legal system provide the optimal care to someone diagnosed with bvFTD. A combination of clinical, neuropsychological, imaging, and genetic tests may help establish a probable (as opposed to merely possible) diagnosis of bvFTD and assist in raising reasonable doubt about the presence of criminal intent.

References

1. O'Malley M, Parkes J, Stamou V, *et al.* Young-onset dementia: scoping review of key pointers to diagnostic accuracy. *BJPsych Open.* 2019; 5(3):e48
2. Rascovsky K, Grossman M. Clinical diagnostic criteria and classification controversies in frontotemporal lobar degeneration. *Int Rev Psychiatry.* 2013; 25(2):145–58
3. Nordvig AS, Goldberg DJ, Huey ED, Miller BL. The cognitive aspects of sexual intimacy in dementia patients: A neurophysiological review. *Neurocase.* 2019; 25(1–2):66–74
4. Silverman HE, Gazes Y, Barker MS, *et al.* Frontal pole hypometabolism linked to reduced prosocial sexual behaviors in frontotemporal dementia and corticobasal syndrome. *J Alzheimer's Disease.* 2020; 77(2):821–30

5. Mendez MF, Chen AK, Shapira JS, Miller BL. Acquired sociopathy and frontotemporal dementia. *Dement Geriatr Cogn Disord*. 2005; 20(2-3):99–104
6. Lanata SC, Miller BL. The behavioural variant frontotemporal dementia (bvFTD) syndrome in psychiatry. *J Neurol Neurosurg Psychiatry*. 2016; 87(5):501–11
7. Taragano FE, Allegri RF, Krupitzki H, *et al*. Mild behavioral impairment and risk of dementia: A prospective cohort study of 358 patients. *J Clin Psychiatry*. 2009; 70(4):584–92
8. Liljegen M, Naasan G, Temlett J, *et al*. Criminal behavior in frontotemporal dementia and Alzheimer disease. *JAMA Neurol*. 2015; 72(3):295–300
9. Mendez MF, Shapira JS. Loss of insight and functional neuroimaging in frontotemporal dementia. *J Neuropsychiatry Clin Neurosci*. 2005; 17(3):413–6
10. Fitch WL. Sexual offender commitment in the United States: Legislative and policy concerns. *Ann N Y Acad Sci*. 2003; 989(1): 489–501
11. Dunsieath NW, Nelson EB, Brusman-Lovins LA, *et al*. Psychiatric and legal features of 113 men convicted of sexual offenses. *J Clin Psychiatry*. 2004; 65(3):293–300
12. Kumfor F, Irish M, Hodges JR, Piguet O. Frontal and temporal lobe contributions to emotional enhancement of memory in behavioral-variant frontotemporal dementia and Alzheimer's disease. *Front Behav Neurosci*. 2014; 8:225
13. Rohrer JD, Lashley T, Schott JM, *et al*. Clinical and neuroanatomical signatures of tissue pathology in frontotemporal lobar degeneration. *Brain*. 2011; 134(Pt 9):2565–81
14. Onyike CU, Diehl-Schmid J. The epidemiology of frontotemporal dementia. *Int Rev Psychiatry*. 2013; 25(2):130–7
15. Woolley JD, Khan BK, Murthy NK, *et al*. The diagnostic challenge of psychiatric symptoms in neurodegenerative disease: Rates of and risk factors for prior psychiatric diagnosis in patients with early neurodegenerative disease. *J Clin Psychiatry*. 2011; 72(2):126–33
16. Mendez M, Parand L, Akhlaghipour G. Bipolar disorder among patients diagnosed with frontotemporal dementia. *J Neuropsychiatry Clin Neurosci*. 2020; 32(4):376–84
17. Ducharme S, Dols A, Laforce R, *et al*. Recommendations to distinguish behavioural variant frontotemporal dementia from psychiatric disorders. *Brain*. 2020; 143(6):1632–50
18. Rascovsky K, Hodges JR, Knopman D, *et al*. Sensitivity of revised diagnostic criteria for the behavioural variant of frontotemporal dementia. *Brain*. 2011; 134(Pt 9):2456–77
19. Bruun M, Koikkalainen J, Rhodius-Meester HFM, *et al*. Detecting frontotemporal dementia syndromes using MRI biomarkers. *NeuroImage Clin*. 2019; 22:101711
20. Gjerum L, Frederiksen KS, Henriksen OM, *et al*. Evaluating 2-[18F]FDG-PET in differential diagnosis of dementia using a data-driven decision model. *NeuroImage Clin*. 2020; 27:102267
21. Nathani M, Jaleel V, Turner A, *et al*. When you hear hoofbeats, think horses and zebras: The importance of a wide differential when it comes to frontotemporal lobar degeneration. *Asian J Psychiatr*. 2020; 47:101875
22. López-Cáceres A, Velasco-Rueda M, Garcia-Cifuentes E, *et al*. Analysis of heritability across the clinical phenotypes of frontotemporal dementia and the frequency of the C9ORF72 in a Colombian population. *Front Neurol*. 2021; 12:681595
23. Balachandran S, Matlock EL, Conroy ML, Lane CE. Behavioral variant frontotemporal dementia: Diagnosis and treatment interventions. *Curr Geriatr Rep*. 2021; 10(3):101–7
24. Pressman PS, Matlock D, Ducharme S. Distinguishing behavioral variant frontotemporal dementia from primary psychiatric disorders: A review of recently published consensus recommendations from the neuropsychiatric international consortium for frontotemporal dementia. *J Neuropsychiatry Clin Neurosci*. 2021; 33(2):152–6
25. Goldman JS, Farmer JM, Wood EM, *et al*. Comparison of family histories in FTLT subtypes and related tauopathies. *Neurology*. 2005; 65(11):1817–9
26. Moore KM, Nicholas J, Grossman M, *et al*. Age at symptom onset and death and disease duration in genetic frontotemporal dementia: An international retrospective cohort study. *The Lancet Neurology*. 2020; 19(2):145–56
27. Olney NT, Spina S, Miller BL. Frontotemporal dementia. *Neurol Clin*. 2017; 35(2):339–74
28. Sha SJ, Takada LT, Rankin KP, *et al*. Frontotemporal dementia due To C9ORF72 mutations clinical and imaging features. *Neurology*. 2012; 79(10):1002–11
29. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Arlington, VA: American Psychiatric Association; 2013
30. Boutoleau-Bretonnière C, Evrard C, Hardouin JB, *et al*. DAPHNE: A new tool for the assessment of the behavioral variant of frontotemporal dementia. *Dement Geriatr Cogn Dis Extra*. 2015; 5(3):503–16
31. Christidi F, Migliaccio R, Santamaría-García H, *et al*. Social cognition dysfunctions in neurodegenerative diseases: Neuroanatomical correlates and clinical implications. *Behav Neurol*. 2018; 2018:1849794
32. Goodkind MS, Sturm VE, Ascher EA, *et al*. Emotion recognition in frontotemporal dementia and Alzheimer's disease: A new film-based assessment. *Emotion*. 2015; 15(4):416–27
33. Seeley WW, Menon V, Schatzberg AF, *et al*. Dissociable intrinsic connectivity networks for salience processing and executive control. *J Neurosci*. 2007; 27(9):2349–56
34. Menon V. Large-scale brain networks and psychopathology: A unifying triple network model. *Trends Cogn Sci*. 2011; 15(10): 483–506
35. Cushman F, Greene JD. Finding faults: How moral dilemmas illuminate cognitive structure. *Soc Neurosci*. 2012; 7(3):269–79
36. Chiong W, Wilson SM, D'Esposito M, *et al*. The salience network causally influences default mode network activity during moral reasoning. *Brain*. 2013; 136(Pt 6):1929–41
37. Pasquini L, Nana AL, Toller G, *et al*. Salience network atrophy links neuron type-specific pathobiology to loss of empathy in frontotemporal dementia. *Cereb Cortex*. 2020; 30(10):5387–99
38. Sfera A, Osorio C, Gradini R, Price A. Neurodegeneration behind bars: From molecules to jurisprudence. *Front Psychiatry*. 2014; 5:115
39. Voon V, Mole TB, Banca P, *et al*. Neural correlates of sexual cue reactivity in individuals with and without compulsive sexual behaviours. *PLoS One*. 2014; 9(7):e102419
40. Tekin S, Cummings JL. Frontal-subcortical neuronal circuits and clinical neuropsychiatry: An update. *J Psychosom Res*. 2002; 53(2):647–54
41. Tranel D, Bechara A, Denburg NL. Asymmetric functional roles of right and left ventromedial prefrontal cortices in social conduct, decision-making, and emotional processing. *Cortex*. 2002; 38(4):589–612
42. Stone VE, Baron-Cohen S, Knight RT. Frontal lobe contributions to theory of mind. *J Cogn Neurosci*. 1998; 10(5):640–56
43. Bertoux M, O'Callaghan C, Dubois B, Hornberger M. In two minds: Executive functioning versus theory of mind in behavioural variant frontotemporal dementia. *J Neurol Neurosurg Psychiatry*. 2016; 87(3):231–4
44. Giovagnoli AR, Bell B, Erbetta A, *et al*. Analyzing theory of mind impairment in patients with behavioral variant frontotemporal dementia. *Neurol Sci*. 2019; 40(9):1893–900

45. Desmarais P, Lanctôt KL, Masellis M, *et al.* Social inappropriateness in neurodegenerative disorders. *Int Psychogeriatr.* 2018; 30(2):197–207
46. Vogel A, Jørgensen K, Larsen IU. Normative data for Emotion Hexagon test and frequency of impairment in behavioral variant frontotemporal dementia, Alzheimer's disease and Huntington's disease. *Appl Neuropsychol Adult.* 2022; 29(1):127–32
47. O'Callaghan C, Bertoux M, Irish M, *et al.* Fair play: Social norm compliance failures in behavioural variant frontotemporal dementia. *Brain.* 2016; 139(Pt 1):204–16
48. Ahmed RM, Goldberg ZL, Kaizik C, *et al.* Neural correlates of changes in sexual function in frontotemporal dementia: implications for reward and physiological functioning. *J Neurol.* 2018; 265(11):2562–72
49. Mendez MF, Shapira JS. Hypersexual behavior in frontotemporal dementia: A comparison with early-onset Alzheimer's disease. *Arch Sex Behav.* 2013; 42(3):501–9
50. Mendez MF, Chow T, Ringman J, *et al.* Pedophilia and temporal lobe disturbances. *J Neuropsychiatry Clin Neurosci.* 2000; 12(1): 71–6
51. Black B, Muralee S, Tampi RR. Inappropriate sexual behaviors in dementia. *J Geriatr Psychiatry Neurol.* 2005; 18(3):155–62
52. Rodriguez M, Ellis A. The neuropsychological function of older first-time child exploitation material offenders: A pilot study. *Int'l J Offender Therapy & Comp Criminology.* 2017; 62(8):2367–73
53. Snyder HN. Sexual assault of young children as reported to law enforcement: Victim, incident, and offender characteristics. Bureau of Justice Statistics [Internet]; 2000. Available from: <https://bjs.ojp.gov/content/pub/pdf/saycrle.pdf>. Accessed March 2, 2022
54. Flynn EE. Elders as perpetrators. In Rothamn MB, Dunlop BD, Entzel P, editors. *Elders, Crime, and the Criminal Justice System.* New York City: Springer Publishing Company; 2000. p. 72-3
55. Hart M. The geriatric sex offender: Senile or pedophile. *Law & Psychol Rev.* 2008; 32:153–62
56. Fazel S, Hope T, O'Donnell I, *et al.* Psychiatric, demographic and personality characteristics of elderly sex offenders. *Psychol Med.* 2002; 32(2):219–26
57. Fazel S, Grann M. Older criminals: A descriptive study of psychiatrically examined offenders in Sweden. *Int J Geriatr Psychiatry.* 2002; 17(10):907–13
58. Liljegen M, Landqvist Waldö M, Frizell Santillo A, *et al.* Association of neuropathologically confirmed frontotemporal dementia and Alzheimer Disease with criminal and socially inappropriate behavior in a Swedish cohort. *JAMA Netw Open.* 2019; 2(3):e190261
59. Rainero I, Rubino E, Negro E, *et al.* Heterosexual pedophilia in a frontotemporal dementia patient with a mutation in the progranulin gene. *Biological Psychiatry.* 2006; 59(1):1–6
60. Mendez MF. The unique predisposition to criminal violations in frontotemporal dementia. *J Am Acad Psychiatry Law.* 2010 Sep; 38(3):318–23
61. *United States v. Dreyer*, 705 F.3d 951 (9th Cir. 2013)
62. Darby RR, Edersheim J, Price BH. What patients with behavioral-variant frontotemporal dementia can teach us about moral responsibility. *AJOB Neuroscience.* 2016; 7(4):193–201
63. Mendez MF, Anderson E, Shapira JS. An investigation of moral judgement in frontotemporal dementia. *Cogn Behav Neurol.* 2005; 18(4):193–7
64. *State v. Ford*, 2007 Ohio 5722 (Ohio Ct. App. 2007)
65. MacIntyre MR, Darby WC, Sones AC, *et al.* Voluntary intoxication, homicide, and mens rea: Past, present, and future. *Behav Sci & L.* 2021; 39(2):150–69
66. Husband killed by wife with rare form of dementia. BBC [Internet]; 2019 Jun 28. Available from: <https://www.bbc.com/news/uk-england-south-yorkshire-48805367>. Accessed March 22, 2022
67. *In re Pool*, 858 S.E.2d 771 (N.C. 2021)
68. Warren-Hicks C. Pensacola man sentenced to life in prison in 'blue moon' triple murder case. *Pensacola News Journal* [Internet]; 2020 Feb 7. Available from: <https://www.pnj.com/story/news/crime/2020/02/07/donald-hartung-blue-moon-murder-case-pensacola-death-life-in-prison-jury/4690843002>. Accessed March 22, 2022
69. *DPP v. Gibson* [2019] VSC 328, 10 (Austl.)
70. *United States v. Sims*, 428 F.3d 945 (10th Cir. 2005)
71. Hanson RK. Recidivism and age: Follow-up data from 4,673 sexual offenders. *J Interpers Violence.* 2002; 17(10):1046–62
72. Wollert R. Low base rates limit expert certainty when current actuarials are used to identify sexually violent predators: An application of Bayes's theorem. *Psychol Pub Pol'y & L.* 2006; 12(1):56–85
73. Booth BD. Elderly sexual offenders. *Curr Psychiatry Rep.* 2016; 18(4):34
74. *United States v. Comstock*, 560 U.S. 126 (2010)
75. *Kansas v. Crane*, 534 U.S. 407 (2002)
76. *Kansas v. Hendricks* 521 U.S. 346 (1997)
77. Ozkan B, Wilkins K, Muralee SM, *et al.* Pharmacotherapy for inappropriate sexual behaviors in dementia: A systematic review of literature. *Am J Alzheimers Dis Other Demen.* 2008; 23(4): 344–54
78. Guay DRP. Inappropriate sexual behaviors in cognitively impaired older individuals. *Am J Geriatr Pharmacother.* 2008; 6(5):269–88
79. Thibaut F, Cosyns P, Fedoroff JP, WFSBP Task Force on Paraphilias, *et al.* The World Federation of Societies of Biological Psychiatry (WFSBP) 2020 guidelines for the pharmacological treatment of paraphilic disorders. *World J Biol Psychiatry.* 2020; 21(6):412–90
80. Haussermann P, Goecker D, Beier K, *et al.* Low-dose cyproterone acetate treatment of sexual acting out in men with dementia. *Int Psychogeriatr.* 2003; 15(2):181–6
81. Fonseca L, Simões S, Ferreira P, *et al.* Ciproterone effect on compulsive masturbation in a frontotemporal dementia patient. *J Neuropsychiatry Clin Neurosci.* 2010; 22(3):e3–352
82. Light SA, Holroyd S. The use of medroxyprogesterone acetate for the treatment of sexually inappropriate behaviour in patients with dementia. *J Psychiatry Neurosci.* 2006; 31(2):132–4
83. Ott BR. Leuprolide treatment of sexual aggression in a patient with dementia and the Kluver-Bucy syndrome. *Clinical Neuropharmacology.* 1995; 18(5):443–7
84. Rich SS, Ovsiew F. Leuprolide acetate for exhibitionism in Huntington's disease. *Mov Disord.* 1994; 9(3):353–7
85. Le C, Finger E. Pharmacotherapy for neuropsychiatric symptoms in frontotemporal dementia. *CNS Drugs.* 2021; 35(10):1081–96
86. Young JJ, Lavakumar M, Tampi D, *et al.* Frontotemporal dementia: latest evidence and clinical implications. *Ther Adv Psychopharmacol.* 2018; 8(1):33–48
87. Cotelli M, Adenzato M, Cantoni V, *et al.* Enhancing theory of mind in behavioural variant frontotemporal dementia with transcranial direct current stimulation. *Cogn Affect Behav Neurosci.* 2018; 18(6):1065–75
88. *United States v. Graziano*, 668 F. App'x 179 (8th Cir. 2016)