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## Relationship Turmoil and Emotional Empathy in Frontotemporal Dementia

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### Abstract

**Background:** Behavioral variant frontotemporal dementia (bvFTD) is characterized by marked deficits in empathy and social behavior; however, the impact of these symptoms on partner relationships has not been quantitatively measured.

**Objective:** We aimed to determine the effect of empathy loss and behavioral symptoms on partner and familial relationship status in bvFTD. We ascertained whether patients were currently in marriage/partner relationships or were separated/divorced, the timing and duration of these relationships, and whether the patients had relationship infidelity. We investigated the relationship status of 483 patients (156 with bvFTD, 38 with nonfluent variant primary progressive aphasia, 72 with semantic variant primary progressive aphasia, 49 with corticobasal syndrome, 45 with progressive supranuclear palsy syndrome, and 123 with Alzheimer's disease) over the course of follow-up, and correlated relationship status with patients' first visit Interpersonal Reactivity Index and Neuropsychiatric Inventory.

**Results:** Relationship dissolution and infidelity were significantly more frequent among patients with bvFTD than in the other groups. Across all patients, empathy loss was associated with relationship dissolution. In the bvFTD group, patients who experienced relationship dissolution or infidelity had significantly lower empathy than those who did not.

**Conclusions:** Changes in relationship status differed across dementia groups and were associated with empathy decline.

### Keywords

Frontotemporal dementia; Alzheimer's disease; empathy; marital relationships

### Introduction

Frontotemporal dementia (FTD) is a young-onset neurodegenerative disease characterized by changes in behavior and language, often with focal atrophy of the frontal and/or anterior

temporal lobes (1). The three main clinical variants of FTD are behavioral variant FTD (bvFTD), nonfluent variant primary progressive aphasia (nfvPPA), and semantic variant primary progressive aphasia (svPPA). Two additional dementia syndromes with prominent abnormalities in movement are also considered part of the FTD spectrum - corticobasal syndrome (CBS) and progressive supranuclear palsy syndrome (PSP-S). The primary deficits in bvFTD are behavioral, manifested as striking social, emotional, and personality changes. These profound changes result in caregiver stress that exceeds that in Alzheimer's disease (AD) (2, 3), a disease in which there is more socioemotional preservation than in FTD. This high caregiver stress in bvFTD often is driven by patients' lack of empathy, and prior studies have also linked loss of a caring marital relationship with patients' loss of empathy (4). Empathy involves the ability to understand and share another's emotions, and is key to reciprocity and intimacy in relationships (5). Reduction in communication and a decrease in emotional connectedness between patients with dementia and their caregivers are key contributors to spousal caregiver burden (5, 6). Loss of empathy is one of the core diagnostic symptoms of bvFTD (7), and is more severe in patients with bvFTD and svPPA than in patients with AD(2, 3), who actually display heightened empathy in the form of emotional contagion (8). While empathy deficits are well-established in bvFTD group level studies are lacking about how this decline impacts their partner relationships.

The primary aims of this study were to: (1) investigate marital, partner, or family relationship status across the dementia syndromes and (2) examine whether empathy or other behavioral deficits in the dementia syndromes were associated with relationship status. We hypothesized that patients with bvFTD would have more disruption to their relationships than other dementia syndromes and that loss of empathy would underlie changes in relationship status.

## Methods

### Subjects

In total, 483 patients (156 with bvFTD; 72 svPPA; 38, nfvPPA; 49 CBS; 45 PSP-S; and 123 AD) were recruited through the Memory and Aging Center (MAC) at the University of California, San Francisco. Patients were recruited from observational research studies and met the diagnostic criteria that were accepted at the time of evaluation for bvFTD, nfvPPA, svPPA, PSP-S, CBS, or AD (9–13). In order to ensure the accuracy of diagnoses, for those patients seen at more than one time point we took their most recent diagnosis. Patients were diagnosed by trained MAC staff through a review of data from neurological assessments, clinical interviews, case histories, neuropsychological tests, and brain imaging. For each patient we reviewed research notes to determine the age at disease onset. Demographic data at the time of initial evaluation are summarized in Table 1.

### Measures

The patients' behavioral symptoms were measured using severity scores from the twelve behavioral domains of the Neuropsychiatric Inventory (NPI) questionnaire (14). The Mini Mental Status Examination (MMSE) (15) was used as a global measure of patients' cognitive function. The Clinical Dementia Rating scale (CDR) (16) and CDR sum of boxes

(CDR-SB) were used to measure functional impairment, with higher scores indicating worse disease severity. The Interpersonal Reactivity Index (IRI) (17) is a questionnaire that measures both the cognitive and emotional components of empathy. We assessed emotional empathy using the IRI-Empathic Concern (EC) subscale and cognitive empathy using the IRI-Perspective Taking (PT) subscale. IRI-EC measures the capacity to have an other-centered emotional response that results from the perception of another person's emotional state. IRI-PT measures the capacity to imagine the cognitive perspective of another person. Higher scores reflect greater empathy. Due to patients' lack of insight and impairment, the IRI was administered to their caregivers/study partners who reported on patients' current levels of empathy. These caregivers/study partners were required to have close contact with the patient, and may or may not have been the patients' romantic partners. All measures were derived from the first available time point for each patient.

### Relationship status

We reviewed detailed research visit notes and standardized patient demographic forms to ascertain patients' marital, partner, and family relationship status, accounting for the most current information for each patient. We captured both marriage relationships and unmarried partner relationships using information provided by patients and their study partners. For each patient we recorded the following: marital or relationship status at disease onset, current marital or relationship status, age at most recent marriage, lifetime number of marriages, any recent change (since the time 5 years preceding disease onset) in relationship status or infidelity on the part of patients or their partners (participation in or attempt to initiate sexual activity with another), and estrangement from family (i.e., active avoidance of contact on the part of the patient or non-partner immediate family members).

### Statistical analysis

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS, SPSS Inc, Chicago, IL). Overall differences among the six groups were determined by chi square tests for categorical data and analyses of variance (ANOVAs) for continuous variables. Post hoc tests for ANOVA (Dunnett's T3) and chi square (z-tests with Bonferroni adjustment) were performed to determine whether there were significant differences between pairs of groups while accounting for multiple comparisons. For comparisons of relationship status we controlled for demographic measures that differed among the groups. For relationship status variables that differed significantly among patient groups we explored factors that predicted relationship status using logistic regression, with diagnosis, MMSE, CDR, CDR-SB, NPI (twelve severity subscale scores), and IRI subscales entered into the model simultaneously as predictor variables. Because we hypothesized greater disruption in relationship status in the bvFTD group relative to other diagnoses, we planned additional analyses to identify factors associated with relationship status of patients with bvFTD. We compared general cognitive functioning (MMSE scores), dementia severity (CDR and CDR-SB scores), behavioral problems (total NPI scores), and empathy (IRI-EC and IRI-PT scores) by Mann-Whitney U-tests between patients with bvFTD who had experienced relationship dissolution or infidelity and patients who had not.

## Results

### Analysis of Group Differences

The AD group had the lowest MMSE scores of any group, followed by bvFTD. In post hoc comparisons, patients with AD scored significantly lower than nvPPA ( $p = .03$ ), CBS ( $p = .004$ ) and PSP-S ( $p < .001$ ), and patients with bvFTD scored significantly lower than patients with PSP-S ( $p = .004$ ). By CDR total score and CDR-SB, patients with bvFTD showed greater functional impairment than those in the other groups. Further, patients with bvFTD had significantly higher NPI total scores than the other groups, reflecting their prominent behavioral symptoms. The empathy subscale scores on the IRI also differed significantly among the groups (see Table 1). Post hoc analyses demonstrated significantly lower IRI-EC and IRI-PT scores in bvFTD and svPPA compared to the other groups, which indicated a prominent loss of empathy in these syndromes. For all patients, the informant for the IRI was a romantic partner 77.2% of the time. The informant type (partner vs other) did not differ significantly between the diagnoses ( $\chi^2(5, N=426) = 5.92, p = .31$ ). Across all patients there was no difference in IRI ratings depending on whether the informant was a partner or not (IRI-EC:  $t(421) = -.85, p = .40$ ; IRI-PT:  $t(422) = .29, p = .77$ ).

Table 2 shows the relationship status of the six diagnostic groups. Because age and gender differed significantly among the groups they were included as covariates in all comparisons of relationship status. The six groups did not significantly differ in the following parameters: currently married, currently in a relationship, currently widowed, number of years in current marriage, and lifetime number of marriages. There were no documented reports of infidelity on the part of partners in the time frame of the illness. The frequencies of relationship dissolution (separation or divorce within 5 years from disease onset) and marital infidelity on the part of patients were significantly different, driven by the high rate in bvFTD. Relationship dissolution preceded the diagnosis of a neurodegenerative disease for 16 of 19 patients. Of the 16 patients in the study with an IRI who experienced separation or divorce, the informant was the separated spouse for 5 patients. These 5 showed no significant differences in IRI ratings compared to the informants for the other 11 (IRI-EC:  $t(14) = -.72, p = .48$ ; IRI-PT:  $t(14) = -.58, p = .58$ ). Post hoc comparisons indicated that in patients with bvFTD, the frequency of relationship dissolution (9.80%) was significantly higher than in patients with AD (0.81%). Marital infidelity (11.54%) in patients with bvFTD was significantly higher compared to those in patients with svPPA and AD (both 0%). Descriptions of infidelity by patients with bvFTD included one who rekindled and refused to stop a relationship with an old boyfriend, another who joined a dating group and showed no concern when dates called his home and spoke to his wife, and one with lack of remorse when a work affair was discovered. The frequency of estrangement from family members was higher in patients with bvFTD (2.56%), compared to the other groups; however, this difference was not significant, likely due to the rarity of estrangement across the diagnoses.

### Regression Analyses

Logistic regression analyses revealed that when the dependent variable was relationship dissolution, only the IRI-EC score was a significant predictor (Table 3, overall model  $\chi^2(22) = 38.78, p = .015$ ). Thus, lower empathic concern predicted higher chances of

dissolution and other behavioral symptoms did not. Across all diagnoses there were no significant predictors of infidelity (overall model  $\chi^2(17) = 38.97, p = .002$ ). Notably, all patients with infidelity had bvFTD, so diagnosis was not included as a covariate in this regression. To further explore the risk factors for relationship dissolution or infidelity, and to ensure the significant association with empathy among all patients was not biased by the low empathy of the entire bvFTD group, the bvFTD group was dichotomized according to marital dissolution within 5 years preceding disease onset or according to marital infidelity (Table 4). Patients with bvFTD who experienced relationship separation had significantly lower IRI-EC scores than those who did not have relationship separation. Patients with bvFTD who had relationship infidelity demonstrated lower IRI-EC and IRI-PT scores (Table 4). In contrast with the findings across all diagnoses, among patients with bvFTD there was a significantly higher CDR among those who experienced relationship dissolution than those who did not. As was observed among all diagnoses, global cognitive functioning (MMSE), CDR-SB, and behavioral symptoms (NPI) did not significantly differ between patients who experienced relationship dissolution or infidelity and those who did not.

## Discussion

Medical illnesses, and neurodegenerative diseases in particular, put strain on close relationships. In this study we found that not all neurodegenerative diseases impact partner relationships in the same way. Compared to other neurodegenerative diseases, patients with bvFTD had the highest frequency of separation, divorce, or infidelity during their illness and in the five years preceding disease onset. Across all patients with neurodegenerative disease, separation or divorce was predicted by low empathic concern in the patient. This association of low empathy with relationship dissolution, and an additional correlation with infidelity, also existed among patients with bvFTD, suggesting that while empathy loss affects relationships across all diagnoses, its effect is most pronounced in diseases with the most profound disruption of empathy.

While spouses and partners often assume a caregiver role for patients with dementia, caregivers for patients with bvFTD face particular challenges, which might disproportionately impact relationship status. Previous studies have shown high caregiver strain in bvFTD (2, 4, 18). Some of these studies have linked this caregiver burden to problematic behaviors such as disinhibition, apathy, or aggression (2, 18). While we found weak associations linking relationship dissolution with these behaviors, these were not significant. Instead, we found loss of empathy to be more predictive of divorce or separation.

Loss of empathy, a core diagnostic feature in bvFTD (7), is associated with partners' perceptions that patients lack caring in their relationship (4). Loss of empathy is more severe in bvFTD and svPPA than in AD (2, 3, 19). It is an important factor in social functioning impairment in bvFTD (19) and greatly affects the relationship between patients with bvFTD and their spouses (6). Further, deficits in empathy in patients with bvFTD or svPPA correlate with increased burden on spousal caregivers (4).

In addition, many studies have consistently demonstrated that patients with bvFTD have marked difficulties with emotion recognition, which is critical for successful social

interactions (20–22). Patients with bvFTD also have deficits in emotion regulation that are associated with the psychological distress of their caregivers (23). The inability of patients with bvFTD to read or regulate emotions results in misunderstanding meaning in situations and responding empathically (6). Emotional reactivity can be increased or decreased in bvFTD (24, 25) and increased reactivity to positive emotion has been linked to impaired empathy, potentially by rendering patients unable to share a contextually appropriate reaction with others (24).

The caregivers of patients with bvFTD often experience anger because caregiver emotions are met by patients with a blunted emotional response (6). These emotional changes may be one reason that caregivers of patients with bvFTD report lower marital satisfaction compared to caregivers of patients with AD (26). Caregivers of patients with bvFTD have also reported significantly less communication compared to before symptom onset (27). While cognitive impairment, including language difficulty could be one factor underlying communication difficulty, this change may be driven by the patient's behavioral symptoms, such as apathy or impairment of social cognition.

While changes in empathy and social behavior are challenging for partners when they occur in the context of a known neurologic disorder, they can have an impact long before there is recognition of a disease process. In the present study, we investigated the patients' relationships starting 5 years preceding disease onset. Loss of empathy can be a very early sign, with some patients appearing cold or aloof (28). Initially, many spouses or other family members do not interpret these personality changes as a sign or symptom of disease (29), but as a loss of relationship quality. Significantly, relationship dissolution in this study most often occurred before patients received a formal diagnosis. Our findings of increased frequency of separation or divorce suggest that changes in empathy contribute to relationship turmoil preceding recognized disease onset.

The frequency of marital infidelity in patients with bvFTD was significantly higher than that in patients with other forms of dementia. There are several potential links between the well-established socioemotional dysfunction of patients with bvFTD and infidelity. Empathy scores were significantly lower in patients with bvFTD who experienced marital infidelity; however, logistic analysis among all patients groups did not show a significant correlation with the IRI-EC or IRI-PT scores, potentially due to the rarity of infidelity in the other neurodegenerative groups. The description of some of some patients' infidelity suggests a lack of concern about negative consequences, consistent with prior studies that show punishment insensitivity in bvFTD (30). Although patients with bvFTD often demonstrate hyposexuality (27, 28), some exhibit hypersexuality (31, 32). This hypersexual behavior is associated with degeneration of right hemisphere subcortical structures and linked to other reward-seeking behaviors (32). Patients with bvFTD display diminished self-conscious emotion (33). Self-conscious emotions such as embarrassment, guilt, and shame are important to avoid violating social norms. These deficits in self-conscious emotion in bvFTD may also contribute to infidelity.

A potential limitation of this study is reliance on clinician documentation of patients' lifetime relationship histories. Ratings of empathy and behavior changes were also

determined by caregiver report. Future studies with objective measures of empathy could account for any bias in the caregivers' assessments. The frequency of certain relationship issues may be underestimated in this study; for example, patients who are estranged from family may be less likely to participate in research studies.

## Conclusions

The present study demonstrates that the frequency of relationship dissolution in patients with bvFTD is significantly higher than that in patients who have other dementia syndromes, and is predicted by the lower empathy of these patients. Awareness of this increased risk for relationship turmoil can prompt treating clinicians to proactively provide counseling and support to patients' partners and family members. These findings also suggest the importance to patients and families of targeting empathy in future therapeutic trials for bvFTD.

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**Table 1.**

Patient Characteristics by Diagnostic Group

	bvFTD		nfvPPA		svPPA		CBS		PSP-S		AD		Statistics and P value
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	
Age	156	60.94 (8.50) <sup>b,d,e,f</sup>	38	66.47 (9.93) <sup>d</sup>	72	63.50 (6.58) <sup>e</sup>	49	65.51 (8.57) <sup>d</sup>	45	68.82 (7.29) <sup>d,c</sup>	123	66.93 (10.78) <sup>d</sup>	$F(1,5)= 9.59, p<001$
Gender (M/F)	156	94/62	38	14/24	72	36/36	49	21/28	45	22/23	123	56/67	$\chi^2(5, N=483)=11.18, p<05$
MMSE	152	21.84 (7.51) <sup>e</sup>	35	23.53 (7.32) <sup>f</sup>	69	22.17 (7.54)	46	24.33 (4.99) <sup>f</sup>	43	25.42 (4.73) <sup>d,f</sup>	111	20.80 (5.98) <sup>b,d,e</sup>	$F(1,5)= 4.77, p<001$
CDR	152	1.33 (0.74) <sup>b,c,d,e,f</sup>	36	0.51 (0.41) <sup>d,f</sup>	72	0.78 (0.52) <sup>d</sup>	44	0.72 (0.59) <sup>d</sup>	43	0.87 (0.67) <sup>d</sup>	118	0.89 (0.42) <sup>a,b</sup>	$F(1,5)= 19.32, p<001$
CDR-SB	152	7.50 (3.63) <sup>b,c,d,e,f</sup>	36	2.17 (2.04) <sup>a,c,e,f</sup>	72	4.34 (3.12) <sup>a,b</sup>	44	3.57 (3.29) <sup>d</sup>	43	4.84 (3.78) <sup>a,b</sup>	118	4.95 (2.50) <sup>a,b</sup>	$F(1,5)= 26.02, p<001$
NPI	149	45.76 (21.39) <sup>b,c,d,e,f</sup>	33	12.58 (13.68) <sup>a,c,e</sup>	69	31.49 (19.95) <sup>a,b,d,f</sup>	45	22.96 (16.47) <sup>d,c</sup>	42	29.26 (18.80) <sup>a,b</sup>	45	19.07 (16.30) <sup>a,c</sup>	$F(1,5)= 29.27, p<001$
IRI-EC	134	18.78 (6.53) <sup>b,c,d,e,f</sup>	34	25.47 (5.02) <sup>d</sup>	64	22.92 (7.68) <sup>d,f</sup>	41	23.78 (7.07) <sup>d</sup>	40	23.95 (7.07) <sup>d</sup>	110	26.79 (5.16) <sup>d,c</sup>	$F(1,5)= 20.69, p<001$
IRI-PT	133	12.21 (5.34) <sup>b,c,d,e,f</sup>	34	21.44 (5.44) <sup>d,c</sup>	65	15.42 (6.72) <sup>a,b,e,e</sup>	41	19.27 (6.32) <sup>d</sup>	41	20.29 (7.13) <sup>d,c</sup>	110	19.05 (6.14) <sup>d,c</sup>	$F(1,5)= 26.25, p<001$

All variables were derived from the first available time point. Continuous variables compared by ANOVA with post-hoc pairwise Dunnett's T3 tests. Gender compared by chi square.

<sup>a</sup>  $p < .05$  versus bvFTD group

<sup>b</sup>  $p < .05$  versus nfvPPA group

<sup>c</sup>  $p < .05$  versus svPPA group

<sup>d</sup>  $p < .05$  versus CBS group

<sup>e</sup>  $p < .05$  versus PSP-S group

<sup>f</sup>  $p < .05$  versus AD group.

MMSE, Mini-Mental State Examination; CDR, Clinical Dementia Rating; CDR-SB, CDR sum of boxes; NPI, Neuropsychiatric Inventory; IRI, Interpersonal Reactivity Index; EC, empathic concern; PT, perspective taking.

**Table 2.**

Relationship Status by Diagnostic Group

	bvFTD (n=156)	nvPPA (n=38)	svPPA (n=72)	CBS (n=49)	PSP-S (n=45)	AD (n=123)	Statistics and P value
Currently married, N (%)	126 (82.35)	32 (84.21)	61 (84.72)	38 (82.61)	39 (88.64)	91 (75.83)	$\chi^2(5, N=473)=4.87, p=.43$
Current relationship, N (%)	131 (85.62)	34 (89.47)	64 (88.89)	40 (86.96)	41 (91.11)	95 (79.17)	$\chi^2(5, N=474)=6.24, p=.28$
Currently widowed, N (%)	4 (2.56)	2 (5.26)	1 (1.39)	2 (4.08)	1 (2.22)	11 (8.94)	$\chi^2(5, N=481)=9.53, p=.09$
Number of years in current marriage, Mean (SD)	28.00 (14.09)	31.38 (18.55)	31.17 (15.08)	33.47 (15.27)	38.75 (14.08)	28.78 (14.60)	$F(1,5)=.26, p=.94$
Number of marriages, Mean (SD)	1.19 (0.53)	1.22 (0.71)	1.18 (0.59)	1.13 (0.62)	1.11 (0.39)	1.08 (0.43)	$F(1,5)= 1.03, p=.40$
Marriage within 5 years disease onset, N (%)	5 (3.25)	1 (2.56)	0 (0)	0 (0)	0 (0)	0 (0)	$\chi^2(5, N=480)=9.29, p=.10$
Separation within 5 years disease onset, N (%)	9 (5.88)	0 (0)	2 (2.78)	0 (0)	0 (0)	1 (0.81)	$\chi^2(5, N=480)=12.03, p=.034^*$
Divorce within 5 years disease onset, N (%)	8 (5.23)	0 (0)	1 (1.39)	0 (0)	0 (0)	0 (0)	$\chi^2(5, N=480)=14.32, p=.014^*$
Separation or divorce within 5 years disease onset, N (%)	15 (9.80) <sup>a</sup>	0 (0)	3 (4.17)	0 (0)	0 (0)	1 (0.81) <sup>b</sup>	$\chi^2(5, N=480)=22.40, p<.001^*$
Marital infidelity within 5 years disease onset, N (%)	18 (11.54) <sup>a,c</sup>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0) <sup>b</sup>	$\chi^2(5, N=483)=39.19, p<.001^*$
Estrangement from family, N (%)	4 (2.56)	0 (0)	1 (1.39)	0 (0)	0 (0)	1 (0.81)	$\chi^2(5, N=483)=4.08, p=.54$

All determinations of relationship status incorporate the latest available information for each patient. Chi-square Test (percentages) with post-hoc z-test (Bonferroni corrected) or ANCOVA (means), corrected for age and gender with post-hoc Dunnett's T3 tests.

\*  $p<.05$

<sup>a</sup>  $p<.05$  compared to AD group.

<sup>b</sup>  $p<.05$  compared to bvFTD group.

<sup>c</sup>  $p<.05$  compared to svPPA group.

**Table 3.**

Odds ratios for separation or divorce within 5 years preceding disease onset and marital infidelity by all patient groups

		Odds ratio (95% Confidence Interval)	P Value
<b>Separation or divorce within 5 years preceding disease onset</b>			
	Diagnosis		.73
	MMSE	1.00 (0.90–1.11)	.96
	CDR	8.30 (0.86–80.57)	.07
	CDR-SB	0.66 (0.40–1.07)	.09
NPI subscale severity scores	Delusions	1.57 (0.80–3.10)	.19
	Hallucinations	0.47 (.09–2.55)	.38
	Agitation	1.71 (0.75–3.89)	.20
	Depression	1.73 (0.82–3.66)	.15
	Anxiety	1.20 (0.60–2.38)	.61
	Euphoria	1.35 (0.69–2.65)	.39
	Apathy	0.79 (0.37–1.68)	.54
	Disinhibition	0.74 (0.32–1.71)	.48
	Irritability	0.89 (0.45–1.74)	.73
	Aberrant motor	1.09 (0.55–2.16)	.81
	Sleep	0.86 (0.45–1.61)	.63
	Eating behavior	0.88 (0.42–1.86)	.74
IRI subscales	Empathic concern	0.81 (0.69–0.94)	.01*
	Perspective taking	1.15 (0.98–1.36)	.08
<b>Marital infidelity</b>			
	MMSE	1.10 (0.96–1.25)	.17
	CDR	2.38 (0.23–24.28)	.46
	CDR-SB	1.03 (0.61–1.75)	.91
NPI subscale severity scores	Delusions	0.55 (0.21–1.45)	.22
	Hallucinations	0	1.00
	Agitation	1.13 (0.49–2.58)	.78
	Depression	1.42 (0.66–3.07)	.37
	Anxiety	1.09 (0.53–2.26)	.82
	Euphoria	1.40 (0.73–2.66)	.31
	Apathy	1.03 (0.45–2.35)	.94
	Disinhibition	2.05 (0.87–4.82)	.10
	Irritability	0.85 (0.42–1.74)	.66
	Aberrant motor	0.87 (0.43–1.76)	.70
	Sleep	0.85 (0.45–1.60)	.61
	Eating behavior	0.80 (0.38–1.71)	.57
IRI subscales	Empathic concern	0.88 (0.77–1.02)	.09
	Perspective taking	0.88 (0.72–1.09)	.25

\* $p < .05$ . Binary logistic analyses

Group Differences between bvFTD Patients with relationship dissolution and marital infidelity

**Table 4.**

	Separation or divorce within 5 years preceding disease onset			Patient marital infidelity		
	Yes	No	P value	Yes	No	P value
<b>MMSE</b>	20.2 (9.28)	22.10 (7.33)	.42	22.53 (8.92)	21.76 (7.35)	.34
<b>CDR</b>	1.73 (0.80)	1.28 (0.72)	.02*	1.47 (0.92)	1.31 (0.71)	.65
<b>CDR-SB</b>	8.83 (3.63)	7.34 (3.65)	.17	8.36 (3.83)	7.38 (3.60)	.29
<b>NPI</b>	49.36 (19.30)	45.64 (21.79)	.56	54.17 (21.19)	44.60 (21.24)	.11
<b>IRI-EC</b>	13.92 (3.63)	19.39 (6.51)	.003*	14.71 (5.44)	19.26 (6.50)	.02*
<b>IRI-PT</b>	10.50 (3.12)	12.69 (5.06)	.17	9.86 (3.48)	12.78 (5.00)	.02*

\*  $p < .05$ . Mann-Whitney U tests. All values reported as Mean (SD)