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Tremor and Other Hyperkinetic Movements

Articles

Psychological Suffering in Essential Tremor: A Study of Patients and Those Who Are Close to Them

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Abstract

Background: Although the motor and non-motor features of essential tremor (ET) have been characterized in detail, it is not known whether ET patients suffer psychologically and whether those who are close to them consider them to be suffering in this way.

Methods: Fifty ET patients and 50 "close others" (COs), identified by patients "as someone who knows you well and sees you often" and who can "provide a different perspective on your well-being", reported their own depressive symptoms, daily stress, and perceptions of patient psychological suffering and patient overall suffering with validated scales. ET patients' tremor severity, duration, disability, cognition, and number of medications were also assessed.

Results: ET patients reported levels of psychological suffering within the range documented in arthritis and dementia patients from previous studies, and COs perceived significantly more psychological suffering in patients than patients reported themselves. Regression models, controlling for tremor severity, duration, and disability revealed that patients' greater psychological suffering was associated with greater patient depression. The greater perceptions of COs of patient psychological and overall suffering were associated with greater CO depression and daily stress. Sensitivity analysis showed that patients' cognitive status or number of medications did not affect the results.

Discussion: Multidisciplinary teams caring for ET patients should look beyond simple clinical ET indicators. They should be aware of patient experiences and perceptions of COs of psychological and overall suffering. This will help guide the development of evidence-based, supportive interventions that improve communication about the needs of ET patients and those who are close to them.

Keywords: Essential tremor, suffering, depression, non-motor, clinical

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Introduction

Essential tremor (ET) is one of the most prevalent neurological diseases; its hallmark feature is action tremor,[1–4] although other motor features may be present (i.e., intention tremor or mild ataxia).[5–8] The disease is associated with functional disability[9] and diminished quality of life.[10] ET is chronic and progressive, and patients often feel a

worsening of symptoms over time even when their tremor remains stable.[11] In addition to motor features, patients may experience a range of non-motor features, including anxiety, social phobia, depression, and sleep dysregulation.[12–14] Moreover, a significant portion of ET patients (30–60%) have cognitive deficits, which range from subclinical abnormalities to mild cognitive impairment (MCI) and dementia.[10,15,16] Although the motor and non-motor features of ET have been characterized in some detail, it is not known whether ET patients are suffering psychologically and whether those who are close to them (i.e., "close others" [COs], their family members and friends) consider them to be suffering in this way. It is also unknown whether the perception of patient psychological suffering is associated with depression in those who are close to them. Here, we draw from Schulz et al.'s[17] conceptualization and validated measure of psychological suffering to understand these interpersonal processes. Schulz and colleagues define psychological suffering as the frequent experience of negative emotions and thoughts, such as worry, hopelessness, anger, loneliness, and guilt, in the context of a physical illness.[17] In addition, Schulz and colleagues suggest that informants be asked with a single item to rate the patient's suffering on a scale from 1 to 10, where suffering is defined by the informants themselves.

Research on family caregiving shows that family members' perceptions of patient suffering predict family members' poor psychological and physical health. Moreover, this is independent of the physical demands of providing care and the level of the patient's disability or disease severity.[18] Past research also shows that family members tend to overestimate patients' suffering, which may create problems with communication between patients, family members, and other caretakers, as well as clinicians.[19] Little to nothing is known about these interpersonal processes in ET.

This is the first paper to describe and quantify ET patients' experiences of psychological suffering and the correlates of that suffering. Additionally, we quantify the perceptions of COs of psychological suffering beyond physical disability associated with having ET. Furthermore, in the present paper we tested the following specific hypotheses. First, we hypothesized that the perceptions of COs of patient psychological suffering would be higher than patients' self-reports (Hypothesis 1). Second, we hypothesized that greater patient psychological suffering would be associated with greater patient depressive symptoms (Hypothesis 2a), and COs' greater perceptions of patient psychological suffering would be associated with greater depressive symptoms in the COs (Hypothesis 2b). Finally, we hypothesized that the greater perceptions of COs of patient psychological suffering would be associated with greater daily stress for COs (Hypothesis 3). To examine whether the association between psychological suffering and depression was independent of tremor characteristics (i.e., tremor duration, disability, and severity), we entered these tremor characteristics as covariates in our statistical models. We also conducted a sensitivity analysis to account for potential influences of cognitive impairment and comorbidity on our main associations.

Methods

Study design and population

Patients. ET patients were recruited through the Clinical Pathological Study of Cognitive Impairment in Essential Tremor (COGNET; NIH R01 NS086736), which is an ongoing, nationwide, longitudinal study that evaluates cognitive function in older persons with ET (mean age at baseline = 79.2 ± 9.5 years). The study began in July 2014 and recruitment was achieved through advertisements on patient advocacy group websites using the following eligibility criteria: 1) diagnosis of ET, 2) age ⩾ 55 years, 3) no history of surgical interventions for ET, and 4) willingness to be a brain donor and perform study measures. As part of the COGNET protocol, the cohort of ET patients underwent a 4–6-hour evaluation conducted by trained research assistants (S.K., S.M., K.C., or B.R.) in patients' homes throughout the United States. This assessment included motor, neuropsychiatric, and neuropsychological measures at baseline. Based on this assessment, cognitive diagnoses (normal cognition, MCI, or dementia) were assigned to each ET patient through a consensus conference as described in detail.[20] Regular follow-up evaluations were performed at 18-month intervals, using the same measures, to ensure the presence of updated clinical and cognitive data on this cohort of brain donors.

The current analyses, which used data from the baseline assessment, considered the first 50 ET patients and their family members who completed an additional, 30-minute assessment of suffering in ET conducted between October 2015 and July 2016.

For all patients enrolled in this study, ET diagnoses were carefully assigned. First, patients were diagnosed with ET by their local physician (neurologist, internist, or general practitioner). Second, as part of their 4–6-hour evaluation, patients completed a series of structured clinical questionnaires and underwent a standardized, videotaped neurological examination, which included a detailed assessment of postural tremor (two positions), kinetic tremor (five tests), intention tremor of the arms and head, and the motor portion of the Unified Parkinson's Disease Rating Scale[21] except for rigidity. The severity of postural and kinetic tremors was rated (ratings = 0–3) on 12 items by a senior movement disorders neurologist (E.D.L.), resulting in a total tremor score (range 0–36),[22] which is a reliable[23] and valid[24] measure of the severity of the action tremor. Then, published diagnostic criteria (moderate or greater amplitude kinetic tremor [tremor rating ⩾ 2] during three or more videotaped activities or a head tremor in the absence of Parkinson's disease or other known causes)[23–25] were applied.

Close others. COs recruited for this study were identified directly by each patient as "someone who knows you well and sees you often" and who can "provide a different perspective on your well-being." Most of these individuals were family members (88%) and a significant majority (62%) lived with the patients. On average, they provided 5.4 hours of care per week.[26] Data on the demographics of COs, and experiences and perspectives on suffering, were collected during 30-minute telephone interviews conducted by trained research

assistants (S.K., S.M., K.C., B.R., or F.M.) between October 2015 and July 2016.[26]

Standard protocol approvals, registrations, and patient consents

Upon enrollment, all ET patients provided informed written consent approved by the Institutional Review Boards of Columbia and Yale Universities. All COs enrolled in the study provided verbal consent over the telephone approved by the Institutional Review Board of Yale University.

Data collection and measurements

Patients. As part of their 4–6-hour evaluation, each patient was visited at home by a trained research assistant (S.K., S.M., K.C., or B.R.) who conducted a detailed clinical and cognitive assessment and obtained a videotaped neurological examination as described above. This in-person assessment also included the following measures.

Patient psychological suffering. Using a reliable and valid scale from 0 (not at all) to 3 (very often/every day), patients were asked to rate the extent to which they experienced 15 psychological symptoms (e.g., afraid, worried or anxious, a burden to others) during the past 7 days.[17] The present study added three items that ET patients frequently raise during clinical visits (frustrated, focus of unwanted attention, and feeling infirm) to make a modified scale. Scores for the modified scale can range from 0 to 48, with higher scores indicating greater psychological suffering. The score for the unmodified scale can range from 0 to 39. Patients were additionally asked to rate their overall suffering during the past week from 0 (did not suffer at all) to 10 (suffered a great deal).[17]

Patient depressive symptoms. We used the Geriatric Depression Scale (GDS), a self-report measure of 30 questions about the presence of depressive symptoms such as helplessness, hopelessness, and lack of energy.[27] Scores can range from 0 to 30 with higher scores indicating greater depressive symptoms.

Disability. To assess self-reported disability due to tremor, we used a valid and reliable[28,29] disability questionnaire for ET.[28] This questionnaire asked patients to report their difficulty in completing (0= no difficulty, 1=need to modify action, 2=disability) a range of daily activities (e.g., carrying a cup, tying shoe laces, signing name, etc.). The tremor disability score ranged from 0 to 20 with higher scores denoting greater impairment.

Cognitive status. Each patient also had a clinical diagnosis of cognitive status based on a clinical case conference. The status options were normal cognition, MCI, dementia.

Number of medications. Patients self-reported the total number of medications taken; this was used as a surrogate marker for medical comorbidity.

COs. Each CO was contacted by a trained research assistant (S.K., S.M., K.C., B.R., or F.M.) to conduct a semi-structured interview over the telephone. The telephone interviews were conducted between 1 week and 3 months after the in-person assessment of ET cases. COs provided demographic, socioeconomic, and caregiving information. They also completed the following assessments.

Perceived psychological suffering of the patient. COs were asked to rate how often they perceived that the patient was suffering using the same psychological suffering scale and the overall suffering item.

COs' depressive symptoms. COs were asked to complete the Center for Epidemiological Studies Depression Scale (CESD-10; range 0–30).[30] This is a reliable and valid[31] self-report instrument consisting of 10 items that evaluate the frequency of experiencing symptoms such as feeling depressed, feeling fearful, and feeling lonely. Higher scores indicated greater severity of depressive symptoms. The CESD-10 was used to assess COs' depressive symptoms instead of the GDS because many COs were not older adults, making the GDS less appropriate for a diverse sample of ages.

COs' daily stress. COs were asked to rate their average daily stress level with a single item that ranged from 1 (not at all stressed) to 10 (extremely stressed). We used a single item to minimize participant burden and because single item stress measures have been found to be valid and reliable.[32]

Analysis

Statistical analyses were performed in SPSS (version 21.0; Chicago, IL, USA). To describe the extent of self-reported and perceived psychological patient suffering, means and standard deviations are presented. To compare our data with prior studies, we also report the means and standard deviations for the unmodified psychological suffering scale; however, we used the modified psychological suffering scales in all hypothesis-testing analyses. Because the main variables were not normally distributed, we used non-parametric tests (i.e., Wilcoxon Signed Ranks tests, Spearman's rank correlations and the Mann–Whitney tests).

To assess the relationship between self-reported and perceived suffering (independent variables) and depressive symptoms (dependent variable), we used logistic regression models. For this purpose, we divided cases and COs into two categories based on GDS and CESD-10 scores, respectively. ET patients with a GDS score $\geqslant$10 were categorized, according to established guidelines, as having moderate to severe depressive symptoms.[27] COs with a CESD-10 score $\geqslant$8 were categorized as having moderate to severe depressive symptoms.[30,33]

To maintain parsimony in the models predicting depression, we entered only the patient self-reported suffering variables when predicting patient self-reported depression. Likewise, to test associations for COs, we entered only the perceived suffering variables of COs predicting the self-reported depression of COs. Research on close relationships shows that one's own perceptions of partner behaviors and feelings tend to be more predictive of one's own well-being than partner self-reports of their behaviors and feelings.[34] Next, linear regression models assessed the relationship between perceived psychological

and overall suffering (independent variables) and COs' daily stress level (dependent variable). For all models, we controlled for tremor duration, tremor disability score, and total tremor score. Next, to explore the influence of cognitive status of ET patients, we conducted a sensitivity analysis by excluding the dyads of ET patients with cognitive deficits (mild cognitive impairment and dementia) and re-ran all correlations. Finally, to account for ET patients' comorbidity, we examined correlations between ET patients' number of medications (i.e., a surrogate marker for medical comorbidity) and the suffering, depression, and stress variables. We also conducted sensitivity analysis, including number of medications as a covariate in all analyses testing the main hypotheses.

Results

Sample characteristics

Dyads consisted of 50 pairs of ET patients and COs who completed all required questionnaires for the current analysis. The mean age of ET patients was 76.8 ± 10.6 years and the mean age of tremor onset was 42.1 ± 22.1 years (Table 1). The mean age for COs was 65.4 ± 12.5 years. The majority of patients and COs were female (62% and 66%, respectively) (Table 1). Based on cognitive testing, 41 (82%) ET patients had normal cognition, seven (14%) had MCI, and only two (4%) were diagnosed with dementia. Thirty-one (62%) COs lived with the ET patients and a large majority (88%) were either the spouses or adult children. Of the remaining 19 COs, 14 (73.7%) spent at least 30 days per year seeing the ET patients. On average, COs spent 5.4 hours ± 10.2 hours per week caring for the ET patients.

Descriptives

Table 2 shows the means and ranges of patient and CO reports of modified and unmodified patient psychological and overall suffering. In terms of clinical correlates of psychological and overall suffering, as shown in Table 3, ET patients' self-reported psychological suffering was positively correlated with tremor duration ($r=0.31$, $p=0.02$) and tremor disability score ($r=0.36$, $p=0.01$). ET patients' self-reported overall suffering was significantly correlated with tremor disability score ($r=0.36$, $p=0.01$). Additionally, COs' perceptions of psychological suffering were positively correlated with tremor duration ($r=0.28$, $p=0.04$), and perceived overall suffering was similarly correlated with the tremor disability score ($r=0.32$, $p=0.02$; Table 3).

Table 1. **Demographic and Clinical Characteristics of Enrolled Dyads**

	ET Cases	COs
N	50	50
Age (years)	76.8 ± 10.6	65.4 ± 12.5
Female gender	31	33
White race	48	45
Education (years)	16.6 ± 2.5	16.3 ± 2.4
Family history of ET	23	NA
Tremor duration (years)	34.7 ± 21.0	NA
Age at tremor onset (years)	42.1 ± 22.1	NA
Tremor disability score	14.2 ± 4.8	NA
Self-reported head tremor	6	NA
Total tremor score	20.5 ± 5.6	NA
Geriatric depression scale	6.2 ± 5.5	NA
CESD-10	NA	4.7 ± 4.8
Employment status	NA	
Full-time		20
Part-time		8
Unemployed		1
Retired		21

Table 1. Continued

	ET Cases	COs
Marital status	NA	
Single		5
Married		40
Divorced		4
Bereaved		0
Not reported		1
Relationship to case	NA	
Spouse		28
Child		16
Friend		2
Other		4
Times per year seeing case	NA	
1–3		1
4–8		0
9–12		1
13–16		3
20–30		0
>30		14
Lives with case		31
Self-reported daily stress level	NA	4.3 ± 2.1

Abbreviations: CESD-10, Center for Epidemiologic Studies Depression Scale-10; CO, Close Others; ET, Essential Tremor; NA, Not Applicable.
Data are mean ± standard deviation (median) or number (percentage).

Table 2. **ET Patient Suffering Reported by Patient and Perceived by CO: Descriptive Statistics**

	ET patients	COs	p
N	50	50	
Modified psychological suffering score	8.5 ± 7.6 (7.0)	11.4 ± 9.4 (8.0)	0.03[1]
Range	0–35	0–37	
Unmodified psychological suffering score	6.6 ± 6.5 (4.0)	9.0 ± 8.2(6.0)	0.04[1]
Range	0–29	0–34	
Overall suffering score	2.8 ± 2.1 (2.0)	3.4 ± 2.2 (3.0)	0.05[1]
Range	1–8	1–9	

Abbreviations: COs, Close Others; ET, Essential Tremor.
Data are mean ± standard deviation (median) and ranges are also reported.
[1]Wilcoxon Signed Ranks test.

Main hypotheses

Comparing patient and CO reports of patient suffering. As hypothesized (Hypothesis 1), COs perceived significantly more psychological suffering and overall suffering than reported by ET patients (Table 2).

Patient suffering and depressive symptoms. Nine (18%) ET cases and 12 (24%) COs were found to have moderate to severe depressive symptoms. In terms of correlations, patients' depressive symptoms were significantly correlated with self-reported psychological suffering ($r=0.76$, $p<0.001$) and overall suffering ($r=0.47$, $p<0.001$; Table 3).

Table 3. **Correlations Between Suffering (Psychological and Overall) and Demographic and Clinical Variables**

	ET Patients' Self-report of Suffering		COs' Perception of Suffering	
	Correlation with self-reported psychological suffering or mean ± standard deviation (median) of self-reported psychological suffering	Correlation with self-reported overall suffering or mean ± standard deviation (median) of self-reported overall suffering	Correlation with perceived psychological suffering or mean ± standard deviation (median) of perceived psychological suffering	Correlation with perceived overall suffering or mean ± standard deviation (median) of perceived overall suffering
Age of ET patient (years)	r=0.08[1]	r=0.15[1]	r=0.13[1]	r=–0.08[1]
Age of COs (years)	r=–0.07[1]	r=–0.17[1]	r=–0.07[1]	r=–0.07[1]
Gender of ET patient				
Male	11.4 ± 11.9 (6.0)[2]	3.8 ± 2.9 (3.0)[2]	11.4 ± 11.9 (6.0)[2]	3.8 ± 2.9 (3.0)[2]
Female	11.4 ± 7.7 (9.0)	3.1 ± 1.6 (3.0)	11.4 ± 7.7 (9.0)	3.1 ± 1.6 (3.0)
Gender of COs				
Male	7.9 ± 4.1 (7.0)[2]	3.6 ± 2.3 (7.0)*[2]	9.3 ± 7.7 (7.0)[2]	2.9 ± 1.5 (3.0)[2]
Female	8.9 ± 9.0 (7.0)	2.4 ± 1.9 (2.0)	12.5 ± 10.1 (9.0)	3.6 ± 2.5 (3.0)
Education of ET patients (years)	r=–0.07[1]	r=–0.17[1]	r=0.10[1]	r=–0.19[1]
Education of COs (years)	r=0.06[1]	r=0.30*[1]	r=0.17[1]	r=0.15[1]
Family history of ET				
Yes	9.5 ± 9.2 (7.0)[2]	3.3 ± 2.4 (3.0)[2]	9.5 ± 9.2 (7.0)[2]	3.3 ± 2.4 (3.0)[2]
No	11.0 ± 9.4 (11.0)	3.5 ± 2.0 (3.0)	11.0 ± 9.4 (11.0)	3.5 ± 2.0 (3.0)
Tremor duration (years)	r=0.31**[1]	r=0.16[1]	r=0.28**[1]	r=0.20[1]
Age at tremor onset (years)	r=–0.24*[1]	r=–0.10[1]	r=–0.19[1]	r=–0.16[1]
Tremor disability score	r=0.36***[1]	r=0.36**[1]	r=0.12[1]	r=0.32**[1]
Total tremor score	r=0.08[1]	r=0.16[1]	r=0.12[1]	r=0.25*[1]
Total medications for ET patients	r=0.27	r=0.19	r=0.50***	r=0.44***
Psychological suffering score				
ET patient	NA	r=0.54***[1]	r=0.52***[1]	r=0.41***[1]
CO	r=0.52***[1]	r=0.34**[1]	NA	r=0.61***[1]
Overall suffering score				
ET patient	r=0.54***[1]	NA	r=0.34**[1]	r=0.40***[1]
CO	r=0.41***[1]	r=0.40***[1]	r=0.61***[1]	NA
Geriatric Depression Scale	r=0.76***[1]	r=0.47***[1]	r=0.46***[1]	r=0.45***[1]
CESD-10	r=0.25*[1]	r=0.09[1]	r=0.33**[1]	r=0.26[1]
CO stress level	r=0.33**[1]	r=-0.04[1]	r=0.37***[1]	r=0.27*[1]

Abbreviations: CESD-10, Center for Epidemiologic Studies Depression Scale-10; CO, Close Others; ET, Essential Tremor; NA, Not Applicable.
Data are mean ± standard deviation (median), Pearson's or Spearman's rho (degrees of freedom=48).
***Significant at the 0.01 level; **significant at the 0.05 level; *marginally significant at the 0.10 level.
[1]Spearman's rho.
[2]Mann–Whitney test.

Table 4. **Models Assessing ET Patients and COs' Depressive Symptoms**

	Wald Statistic (1 df)	Odds Ratio	95% Confidence Interval	p
Model 1: ET patient psychological suffering predicting depression				
Self-reported psychological suffering	5.52*	1.42	(1.06, 1.91)	0.02
Tremor duration	0.01	1.00	(0.95, 1.06)	0.93
Tremor disability score	3.39	1.41	(0.98, 2.04)	0.07
Total tremor score	2.41	0.81	(0.61, 1.06)	0.12
Constant	3.84	0.00		0.05
Model 2: ET patient overall suffering predicting depression				
Self-reported overall suffering	1.56	1.28	(0.86,1.90)	0.21
Tremor duration	0.36	1.01	(0.97, 1.06)	0.55
Tremor disability score	2.92	1.30	(0.96, 1.74)	0.09
Total tremor score	0.69	0.91	(0.74, 1.13)	0.41
Constant	3.83**	0.01		0.01
Model 3: CO perceived psychological suffering predicting depression				
Perceived psychological suffering	8.96**	1.26	(1.08, 1.47)	0.00
Tremor duration	0.43	0.96	(0.96, 1.08)	0.51
Tremor disability score	0.47	0.69	(0.69, 1.19)	0.49
Total tremor score	4.92*	0.49	(0.49, 0.96)	0.03
Constant	2.41	25.71		0.12
Model 4: CO perceived overall suffering predicting depression				
Perceived overall suffering	7.89**	2.62	(1.34, 5.13)	0.005
Tremor duration	1.16	1.03	(0.98, 1.09)	0.28
Tremor disability score	0.92	0.88	(0.68, 1.14)	0.34
Total tremor score	6.21*	0.65	(0.46, 0.91)	0.01
Constant	4.00*	0.05		

Abbreviations: CO, Close Others; df, Degrees of Freedom; ET, Essential Tremor.
**p<0.01; *p<0.05.

Depressive symptoms in COs were significantly correlated with COs' perceptions of psychological suffering (r=0.33, p=0.02), but not COs' perceptions of overall suffering (r=0.26, p=0.07; Table 3).

Supporting hypotheses 2a and 2b, binary logistic models revealed that greater self-reported psychological suffering was associated with a higher likelihood of ET patients experiencing moderate to severe depressive symptoms (Wald χ^2=5.52, degrees of freedom [df]=1, odds ratio [OR]=1.42, 95% confidence interval [CI]=1.06–1.91, p=0.02; Table 4). However, greater self-reported overall suffering was not significantly associated with a higher likelihood of ET patients experiencing moderate to severe depressive symptoms (Wald χ^2=1.56, df=1, OR=1.28, 95% CI=0.86–1.90, p=0.21). Greater CO perception of psychological suffering (Wald χ^2=8.96, df=1, OR=1.26, 95% CI=1.08–1.47, p<0.001) and overall suffering (Wald χ^2=7.89, df=1,

Table 5. **Models Predicting COs' Daily Stress**

	B Coefficient	Standard Error	Beta	T	p
Model 1: Perceived psychological suffering predicting CO daily stress					
Constant	2.00	1.03		1.95	0.06
Perceived psychological suffering	0.08	0.03	0.34	2.87	0.01
Tremor duration	0.04	0.01	0.35	3.02	0.00
Tremor disability score	0.04	0.05	0.10	0.82	0.42
Total tremor score	–0.02	0.05	–0.05	–0.46	0.65
Model 2: Perceived overall suffering predicting CO daily stress					
Constant	2.19	1.05		2.08	0.04
Perceived overall suffering	0.30	0.12	0.31	2.42	0.02
Tremor duration	0.04	0.01	0.37	3.05	0.00
Tremor disability score	0.02	0.06	0.04	0.31	0.76
Total tremor score	–0.03	0.05	–0.07	–0.54	0.59

Abbreviations: CO, Close Others.
Degrees of freedom=4.

OR=2.62, 95% CI=1.34–5.13, p=0.005) were each associated with a higher likelihood of COs experiencing moderate to severe depressive symptoms.

Patient suffering and COs' stress. Multiple linear regression models (Table 5) also revealed that COs' perception of psychological suffering (β=0.34, t(4)=2.87, p=0.01) and overall suffering (β=0.31, t(4)=2.42, p=0.02) were each associated with higher levels of self-reported daily stress, supporting Hypothesis 3.

Additional analyses

When ET patients without MCI or dementia were in the analysis only (n=41), the correlations between suffering, tremor severity variables, and severity of depressive symptoms in both the ET cases and their COs remained largely the same. Patients' psychological suffering (r=0.75, p<0.001) and overall suffering (r=0.24, p=0.15) were correlated with patient depressive symptoms either significantly or in the same direction. The findings for the depressive symptoms of COs also remained the same as in the main analysis (perceptions of patient psychological suffering, r=0.49, p=0.001; overall suffering, r=0.29, p=0.06). Associations with COs' daily stress were in the same direction but no longer significant (perceived psychological suffering, r=0.20, p=0.20; overall suffering, r=0.22, p=0.15).

Twenty-four of the 50 ET patients were on five medications or more. The mean number of medications was 5.53±4.06 (range= 0–20, SD=4.06). Correlational analysis revealed that COs perceived greater ET psychological and overall suffering when ET patients took more medications; however, ET patients' self-reported psychological and overall suffering were not significantly related to greater number of medications (Table 3). We re-ran all models that included CO perceived suffering variables as predictors, adding ET patients' number of medications as a covariate, and the results did not significantly change (CO perceived psychological suffering still predicted depression (β=0.23, Wald=7.77, p=0.01) and daily stress (β=.36, t=2.66, p=0.01); CO perceived overall suffering still predicted depression (β=1.04, Wald=6.78, p=0.01) and daily stress (β=.39, t=2.90, p=0.01).

To understand how much suffering patients were self-reporting and COs were perceiving for ET patients without high comorbidity, we selected ET patients who took fewer than five medications. ET patients who took fewer than five medications (n=24) reported a mean of 7.29±7.45 for the modified psychological suffering score, 5.92±6.41 for the unmodified psychological suffering score, and 2.57±2.06 for overall suffering. Their COs reported a mean of 7.50±6.00, 5.88±5.44, and 2.71±1.92, respectively. In this subgroup analysis, there were no significant differences between patient and CO reports (p>0.77).

Discussion

To our knowledge, this is the first study to examine the experiences of ET patient suffering, COs' perceptions of ET patient suffering, and the associations with depression for both patients and COs. Our study demonstrates that psychological suffering in ET patients, reported by both patients and COs, is a measurable entity, similar to psychological

suffering in other disease contexts.[17] For example, Schulz and colleagues[17] found that osteoarthritis patients and dementia patients both reported a mean of 7.5 out of a possible 39 for psychological suffering; they also found that caregivers reported means of 8.7 and 11.7 for their perceptions of the suffering of their care-recipients with osteoarthritis and dementia, respectively. The means in the present study, when using the Schulz unmodified scale, were slightly lower than the means in other studies, but comparable (6.6 ± 6.5 for ET patients and 9.0 ± 8.2 for COs). When we looked at ET patients who had low comorbidity, their reports of psychological suffering were lower than for ET patients with high comorbidity. However, they were still well within the range of what has been reported in osteoarthritis and dementia patients. In using the modified scale, we also found that many ET patients frequently feel frustrated, suggesting that this may also be an important aspect of psychological suffering beyond anger and irritability.

The findings that COs overestimate patient psychological suffering are consistent with previous studies of osteoarthritis and dementia and demonstrate that overestimation of suffering also occurs in the context of ET.[19] For example, it has been shown that caregivers of individuals with dementia consistently report greater levels of suffering and lower levels of quality of life for dementia patients than they report themselves.[19] These consistent findings showing overestimation of perceived suffering suggest that clinicians should be careful in using proxy informants exclusively in their assessments. It also suggests that COs may benefit from interventions that enhance communication between patients, COs, and clinicians. On the one hand, a patient's suffering may not be taken seriously; on the other, family members may be perceiving suffering that does not exist. This is especially important given that patient experiences and COs' perceptions of patient suffering have been shown to have implications for both dyad members' mental health.[18] Miscommunication about suffering may also have negative effects on caregivers' and clinicians' support behavior.

In terms of associations with depression, multiple studies[10,35] have suggested that ET patients have a higher prevalence of depression than individuals without ET. The biological basis for depression in ET is unknown at this time. One study suggested that depression could be a secondary response to the motor symptoms.[14] The current study, by examining the role of psychological suffering, provides additional information about sources of depression for people with ET and their family members. As in other studies of different disease contexts, the present findings show that the experience and perception of psychological suffering may be more important than disability and clinical disease severity of ET in predicting mental health outcomes.

This study should be considered in the context of certain limitations. First, the sample size was small, which may have limited the power to detect significant effects; however, numerous significant associations were detected, which makes this unlikely. Second, the ET patients were selected because many of them were ascertained through a disease-specific organization and because they volunteered to undergo an intensive cognitive evaluation as part of the COGNET study. These patients may not be representative of the general ET patient population as they may suffer from more severe disease. However, our sample was not exclusively made up of ET cases with severe tremor; 11 participants (20.0%) were assigned tremor ratings of 1 (low amplitude) or 1.5 (only occasionally moderate amplitude) on all items of the videotaped neurological examination. Third, seven of the ET patients were diagnosed with MCI and two were diagnosed with dementia during their COGNET evaluations, so the validity of their responses to questionnaires could be questioned. However, the exclusion of these patients and their COs from the analysis did not alter our results significantly. Fourth, our measure of comorbidity, number of medications taken, was at best a surrogate marker. Finally, our study was cross-sectional so we were not able to detect directionality or causality of effects. Future studies would benefit from the inclusion of a larger, more representative sample of ET cases and their family members or friends who are followed longitudinally. These studies could also benefit from the use of the same measures of depression for ET patients and their CO. This would allow the use of dyadic models such as the Actor–Partner Interdependence Model, which takes into account the interdependence in dyad members' responses.[36]

In conclusion, this study provides a new understanding of experiences and perceptions of psychological suffering in patients and COs, beyond physical disability, within the context of ET. It provides a clear link between psychological suffering and depressive symptoms in patients and their family members and friends. We hope raising awareness of the ET patients' experiences of psychological suffering and perceptions of those who are close to them helps improve communication with clinicians and provides insight for families and other caregivers experiencing depression in the context of ET.

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