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Association between marital satisfaction of female patients with persistent depressive disorder, and their own and husbands' autism spectrum disorder or attention deficit/hyperactivity disorder traits

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Abstract

Aim: Patients' and spouses' neurodevelopmental traits may influence marital relationships, which are significantly associated with depressive symptoms. However, no studies have examined marital relationships in persistent depressive disorder (PDD) in terms of neurodevelopmental traits. This study aimed to explore the association between the autism spectrum disorder (ASD) or attention-deficit/hyperactivity disorder (ADHD) traits of female PDD patients and both partners' (patient and husband) marital satisfaction.

Methods: A cross-sectional online survey was administered during two predetermined consecutive months at seven institutions. Participants were female outpatients who fulfilled the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition criteria for PDD and their husbands. The instruments of the study were the following validated surveys: the Quality Marriage Index (QMI), the Autism-Spectrum Quotient Japanese version-21 (AQ-J-21), and the Adult ADHD Self-Report Scale Part A (ASRS Part A).

Results: The patients' AQ-J-21 showed a positive significant association with their QMI in all patients who responded to this study's questionnaire, whereas among couples wherein both patient and husband responded, the ASRS Part A exhibited a positive significant association with the patients' QMI. Conversely, the husbands' ASRS Part A exhibited a negative significant association with the patients' QMI.

Conclusion: The patients' ASD and ADHD traits may play a positive role in the marital satisfaction of female PDD patients, while their husbands' ADHD traits may play a negative role. For female PDD patients with low marital satisfaction, it may be important to consider whether their husbands have ADHD traits; if so, it may be necessary to

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develop intervention strategies focused on the traits for improving the low marital satisfaction. However, our conclusions are not sufficiently convincing.

KEYWORDS
adult, attention-deficit/hyperactivity disorder, autism spectrum disorder, marital satisfaction, persistent depressive disorder

INTRODUCTION

Numerous studies have linked stress from intimate relationships with depressive symptoms. Weissman[1] was the first to highlight that major depression was 25 times more frequent in unhappy marriages than in satisfactory marriages. Subsequently, O'Leary et al.[2] estimated that the risk of depressive symptoms increases by 10 times due to marital discord. Additionally, a strong cross-sectional significant association has been found between marital dissatisfaction and depressive symptoms,[3] with poor marital relations promoting depression and vice versa.[4] Factors of marital distress, such as infidelity or threats of a romantic breakup, can induce or exacerbate depressive symptoms.[5] By contrast, supportive relationships, primarily with partners, can protect individuals from the physical and psychological effects of stressful life situations.[6] Furthermore, support, intimacy, and help from partners in implementing coping strategies can facilitate recovery from depressive symptoms.[7]

It is important to note that approximately 20%–30% of major depressive disorders become chronic,[8,9] and the lifetime prevalence of chronic depression is 3%–6%.[9–11] The rate of developing chronic depression is nearly twice as great in women than in men.[11] Currently, persistent depressive disorder (PDD) is defined as a clinical entity in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),[12] although a clear distinction between chronic and nonchronic depression was previously lacking. PDD consists of dysthymia with or without major depressive episodes, chronic major depression, and recurrent major depression with or without a current episode in at least the preceding 2 years.[12] As with a major depressive disorder, one of the most frequent risk factors for chronic depression is the lack of social support in adulthood.[11] Moreover, it has been associated with smaller social networks and less social support in daily life than nonchronic depressive disorders.[13,14] For married female patients with PDD, the marital relationship with their husbands, in other words, their marital satisfaction with their husbands, may have a stronger influence on the symptoms they may have than for married female patients with nonchronic depressive disorders because of their smaller social networks.[13,14] However, no studies have examined the marital satisfaction among couples with female PDD patients.

In recent years, the most common neurodevelopmental disorders, that is, autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD), which are diametrically opposed in their stereotypes, have been demonstrated to impair social interactions, communication skills, and social thinking in ways that may underlie the intimate relationship stress between individuals with ASD or ADHD and their spouses. The prevalences of ASD and ADHD are 2.3% and 5.29%, respectively.[15,16] Although these disorders are usually associated with childhood, 80%–99% and 50% of children diagnosed with ASD and ADHD, respectively, will meet the criteria in adulthood.[17–19] Thus, 2.5%–5% of adults worldwide suffer from ADHD.[20,21] However, ASD and ADHD often remain undiagnosed because of the lack of recognition,[22–24] which may unknowingly cause distress to the patients and their families. Although consistent data are not available on the satisfaction of marital relationships of individuals with ASD, individuals with ASD generally experience difficulties initiating and maintaining intimate relationships.[25] Lau and Peterson[26] found that the presence or absence of ASD symptoms had no significant effect on the marital satisfaction of the patients and their spouses; their marital satisfaction was high. Conversely, Deguchi and Asakura[27] reported that the wives of husbands with ASD reported feelings of loneliness and social exclusion. Subsequently, while individuals with ADHD are often seen as passionate or creative, probably because of their symptoms such as inattention and hyperactivity-impulsivity, the symptoms may also contribute to the high divorce rate and poor marital adjustment.[28,29] VanderDrift et al. suggested that high levels of inattention may result in individuals paying more attention to alternative partners, which in turn leads to a higher inclination toward relationship dissolution during relationship problems. Moreover, individuals with higher levels of hyperactivity-impulsivity may fail to suppress their negative responses to their partners during relationship problems and their desire to search for alternative partners.[29]

Despite the importance of assessing the association between marital dissatisfaction, which has a significant impact on depressive symptoms, and the couple's ASD or ADHD symptoms, clinical studies have been limited to assessing the romantic/marital relationships between patients already diagnosed with ASD or ADHD and their partners/spouses.[26,28,29] To the best of our knowledge, no studies have examined the level of marital satisfaction among female patients with PDD, who have less interpersonal support in their daily lives than those with major depressive disorders, and their husbands from the perspective that the patients or their husbands may have undiagnosed ASD or ADHD.

Therefore, this study explores the association between the ASD or ADHD traits of female patients with PDD and their marital relationship satisfaction. It also explores the association between the latter and the ASD or ADHD traits of their husbands. Additionally, we examined the association of the PDD patients' severity of depressive symptoms with the ASD or ADHD traits and the marital relationship satisfaction of female patients with PDD and their husbands.

Furthermore, the following two preliminary aims were also investigated. As Benazon and Coyne[30] highlight that many spouses of depressed patients have been reported to be depressed, we administered the severity of depressive symptoms to the husbands of the female patients with PDD. Given that Whiffen et al.[31] have reported that depressed female patients have a more fearful attachment than nondepressed patients and that the husbands of chronically depressed female patients exhibit less attachment security than the husbands of nonchronic depressed female patients and the general population, we explored the attachment styles of female patients with PDD and their husbands.

METHODS

Participants and procedures

This study was performed in accordance with the Declaration of Helsinki, and its protocol was approved by the ethics committee of Nagoya City University Graduate School of Medicine and the hospitals participating in this study. The participants comprised female outpatients and their husbands. The female outpatients visited Nagoya City University Hospital, Gokiso Mental Health Clinic, Kamiitabashi Mental Health Clinic, Kuwabara Mental Health Clinic, Toyokawa City Hospital, Kusunoki Mental Hospital, and Gifu Hospital during the two predetermined consecutive months between June 2021 and April 2022. Only female patients aged 20–65, married or in common-law relationships and living with their husbands or partners for at least 12 continuous months, who fulfilled the DSM-5 criteria[12] for PDD, and whose husbands fell within the same age bracket were included. We identified PDD using the Structured Clinical Interview for DSM-5-Research Version.[32] The exclusion criteria included the presence of psychosis, bipolar disorder, mental retardation, and dementia according to the DSM-5 criteria. Overall, 49 pairs of female patients with PDD and their husbands were invited to participate in an online survey administered via Google Forms. The participants voluntarily agreed to participate by clicking an "I agree" button in the electronic questionnaire after reading a guide explaining the study's purpose, response period, data storage mechanism, and that the responses would be kept confidential. No incentive was given to the participants for voluntary participation. Participants completed the electronic questionnaire in an average of 10 min. An attending physician interviewed the female patients with PDD about their PDD onset age and comorbid psychiatric disorders.

Instruments

Quality Marriage Index

The Quality Marriage Index (QMI) is a self-reported scale comprising six items that assess marital relationship satisfaction.[33] The total scores range between 6 and 24, with higher scores indicating higher relationship satisfaction. A Japanese version of this scale, which has been confirmed for good reliability and validity, is available.[34]

Autism Spectrum Quotient

The Autism Spectrum Quotient (AQ) is a self-reported scale comprising 50 items that evaluate the degree of ASD traits present in adults with intelligence scores in the normal range.[35] Two Japanese versions of this scale offering good reliability and validity are available.[36,37] Kurita et al. developed a shortened version of the Japanese version of the AQ (the AQ-J-21) and reported higher sensitivity and specificity than the original 50-item AQ-J. The higher the score, the higher the ASD traits. The cutoff of the AQ-J-21 was set at 12 points.

Adult ADHD Self-Report Scale

The Adult ADHD Self-Report Scale (ASRS-v1.1) is a self-reported scale comprising 18 items that assess ADHD symptoms in line with the DSM-4's ADHD criteria.[38] Japanese versions of this scale offering good reliability and validity are available.[39] The items are divided into Parts A and B, with Part A comprising six questions most acutely predictive of a diagnosis of ADHD (sensitivity = 68.7%, specificity = 99.5%).[38] When four or more of the six questions in Part A are applicable, a high probability exists that the patient exhibits symptoms of ADHD in adulthood. In this study, only the number of positive items found in Part A were used.

Patient Health Questionnaire-9

The Patient Health Questionnaire-9 (PHQ-9) is a widely accepted 9-item self-report scale for assessing depression severity in both clinical practice and scientific research.[40] Responses were scored between 0 and 3, and the total scores ranged between 0 and 27. A score of 10 or higher was a valid cut-off for moderate to severe depression. A Japanese version of this scale, which has been confirmed for good reliability and validity, is available.[41]

Relationship Questionnaire

The Relationship Questionnaire (RQ) is a single-item measure comprising four short paragraphs, each describing an attachment prototype (secure, dismissing, preoccupied, and fearful).[42] First, participants are asked to rate their degree of correspondence to each attachment style on a 7-point scale. Thereafter, they are asked to choose one of the four attachment prototypes that best describes them, providing a single-item variable with four possible values. For analytical purposes, we used a single-item variable only. A Japanese version of this scale offering good reliability and validity is available.

The attachment style was measured using the Japanese version of the RQ.[43]

STATISTICAL ANALYSES

Continuous and categorical data were summarized by the median and interquartile range, as well as the frequency and percentage, respectively. In the correlations evaluated, the scores of the QMI, AQ-J-21, ASRS Part A, and PHQ-9 were all treated as continuous data without categorization. Wilcoxon's rank-sum test and Fisher's exact test were performed to compare groups, while Pearson's product-moment correlation was performed to evaluate the association between the two variables using a 95% confidence interval. As a result of the PDD patients having high PHQ-9 scores (mean 15), a nonhierarchical multiple regression analysis for the QMI with the PHQ-9 score was used as the controlling variable. All statistical analyses were conducted using SAS version 9.4 (SAS Institute Inc.). A P-value of <0.05 was considered statistically significant.

RESULTS

Among the 49 pairs of female patients with PDD and their husbands, 37 patients and 28 husbands completed the online survey. There were 28 couples wherein both the patients and their husbands responded and nine couples wherein only the patients responded. The characteristics of all the participants who responded are presented in Table 1a, and couples where both the female patients and their husbands who responded are described in Table 1b. Compared to their husbands, the patients were significantly less likely to be full-time workers ($P < 0.001$), as presented in Tables 1a and 1b. Moreover, the patients' scores were significantly higher than those of their husbands for PHQ-9 ($P < 0.001$), as highlighted in Tables 1a and 1b. The AQs of the patients and their husbands were significantly different ($P < 0.001$), as shown in Tables 1a and 1b. The husbands were more likely to exhibit a secure style (35.7%) or an insecurely preoccupied style (32.1%) of attachment over other styles. Conversely, the female patients were more likely to exhibit an insecurely fearful style of attachment (59.5%) than other styles of attachment, as shown in Tables 1a and 1b.

The results of the correlation analysis are presented in Table 2a. The AQ-J of all the patients who responded ($r = 0.33$) and those whose husbands also responded ($r = 0.49$) had a positive significant association with their QMI. Subsequently, the ASRS of the patients had a positive significant association with their QMI only in couples wherein both the patient and their husbands responded ($r = 0.38$). Moreover, the ASRS of the husbands exhibited a negative significant association with the QMI of the patients in couples where both the patients and their husbands responded ($r = -0.40$). By contrast, the correlation coefficient between the husbands' AQ-J and the patients' QMI was not significant in couples in which both the patients and their husbands responded. Additionally, the QMI of the husbands exhibited a positive significant association with the QMI of the patients in couples wherein both the patients and their husbands responded ($r = 0.46$). As a result of the PDD patients having high PHQ-9 scores, conducting the nonhierarchical multiple regression analysis for the QMI with the PHQ-9 score as the controlling variable did not alter the aforementioned results in Table 2b.

Additionally, the correlation coefficient between the PDD patients' PHQ-9 scores and the AQ-J-21, ASRS Part A, and QMI scores of all the patients as well as their husbands who responded was not significant, as presented in Table 3.

DISCUSSION

To the best of our knowledge, this study is the first to explore the marital relationship satisfaction among female patients with PDD from the perspective that the patients or spouses may exhibit ASD or ADHD traits. This study yielded some unexpected but useful results. We found that patients' ASD or ADHD traits exhibit a significantly positive association with their marital relationship satisfaction. By contrast, the husbands' ADHD traits exhibit a significantly negative association with the patients' relationship satisfaction.

In this study, the ASD or ADHD traits of the patients were found to have a positive association with the marital relationship satisfaction of the patients in couples wherein both the patients and their husbands responded. The reason for this could be related to the patients' husbands. The husbands were not likely to be depressed (median [IQR] 3.5[1–7]) in couples where both the patients and their husbands responded to this study's questionnaire. Our finding is not consistent with the finding of Benazon et al.,[30] who found that spouses living with depressed patients were significantly more depressed than the general population. Moreover, the husbands in this study tended to exhibit more secure attachment styles than the general population. Specifically, the husbands in this study exhibited a secure style (35.7%) or an insecurely preoccupied style (32.1%) of attachment than other styles of attachment. Kato[43] found that 47% of healthy, nonclinical young adults reported this preoccupied style. By contrast, 19% of them reported a secure style, 29% reported a fearful style, and 7% reported an avoidant style.[43] Cultural differences exist in attachment styles, and although the insecurely preoccupied attachment is categorized as an insecure style, it is generally common among Japanese adults. Even if there are cultural differences in their attachment styles as described above, the husbands of patients with PDD who responded to this study's questionnaire tended to exhibit a secure style than were healthy Japanese young adults. Our finding is not consistent with that of Whiffen et al.,[31] who found that husbands whose wives were diagnosed with chronic depression felt less securely attached than the general population. Benazon et al. included several nonchronic depressed patients, and Whiffen et al. included more mildly depressed patients; by contrast, the PDD female patients in this study have chronic depressive symptoms and their PHQ-9 score was moderate to severe (median [IQR] 17.0[9–21]). Unlike the husbands of

TABLE 1a Demographic and clinical characteristics of all participants

Characteristic		Patients (*n* = 37)	Husbands (*n* = 28)	P[a]
Age (years)	Median (IQR)	42.0 (38–52)	46.5 (42–55)	0.222
Marital duration (years)[b]	Median (IQR)	14.0 (6–20)		
Educational status	*N* (%)			
Junior high school		1 (2.7%)	0 (0.0%)	0.514
High school		10 (27.0%)	9 (32.1%)	
Vocational school		7 (18.9%)	4 (14.3%)	
Junior college		3 (8.1%)	0 (0.0%)	
College/Graduate		16 (43.2%)	15 (53.6%)	
Employment status	*N* (%)			
Employed full-time		6 (16.2%)	26 (92.9%)	<0.001
Employed part-time		6 (16.2%)	0 (0.0%)	
Suspension from office		4 (10.8%)	0 (0.0%)	
Housewife		16 (43.2%)	0 (0.0%)	
Unemployed		5 (13.5%)	2 (7.1%)	
Duration of PDD (years) [only patients]	Median (IQR)	13.0 (6–20)		
Comorbid mental disorders (only patients)	N (%)			
ASD		2 (5.4%)		
ADHD		2 (5.4%)		
Major depressive disorder		18 (48.6%)		
Social anxiety disorder		1 (2.7%)		
Panic disorder		6 (16.2%)		
Agoraphobia		1 (2.7%)		
Generalized anxiety disorder		1 (2.7%)		
Obsessive-compulsive disorder		1 (2.7%)		
Post-traumatic stress disorder		5 (13.5%)		
Somatic symptoms and related disorders		3 (8.1%)		
Family income (yen)[c]	*N* (%)			
<1 million		2 (5.4%)		
1–2 million		0 (0.0%)		
2–4 million		9 (24.3%)		
4–6 million		4 (10.8%)		
6–8 million		11 (29.7%)		
≥8 million		11 (29.7%)		
PHQ-9	Median (IQR)	15.0 (9–20)	3.5 (1–7)	<0.001
QMI	Median (IQR)	18.0 (13–20)	19.0 (17–22)	0.064
RQ	*N* (%)			
Secure		2 (5.4%)	10 (35.7%)	<0.001
Dismissing		2 (5.4%)	4 (14.3%)	
Preoccupied		11 (29.7%)	9 (32.1%)	

(Continues)

TABLE 1a (Continued)

Characteristic		Patients (n = 37)	Husbands (n = 28)	P[a]
Fearful		22 (59.5%)	5 (17.9%)	
AQ-J-21	Median (IQR)	10.0 (9–13)	10.0 (7–12)	0.225
AQ-J-21 ≥ 12	*N* (%)	14 (37.8%)	10 (35.7%)	1.000
ASRS Part A	Median (IQR)	3.0 (2–4)	1.0 (0–3)	0.020
ASRS Part A ≥ 4	N (%)	12 (32.4%)	6 (21.4%)	0.407

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; AQ-J-21, Autism Spectrum Quotient-Japanese version-21; ASD, autism spectrum disorder; ASRS Part A, Adult Self-Report Scale Part A; IQR, interquartile range; PDD, persistent depressive disorder; PHQ-9, Patient Health Questionnaire-9; QMI, Quality Marriage Index; RQ, Relationship Questionnaire.

[a]P is calculated using Wilcoxon's rank-sum test and Fisher's exact test between the value obtained for the patients and that of their husbands.

[b]The score of the marital duration was treated as a missing value because it remained the same as the duration of the disease (N = 1).

[c]Family income was asked only for patients.

female patients with mild and nonchronic depressive symptoms, only husbands with no depressive symptoms and a secure attachment style may have been able to stay married to female patients with more severe and chronic depressive symptoms. Such husbands may then have fully understood and provided support not only for the patient's (spouse's) PDD symptoms but also for her ASD and ADHD traits. In other words, the husbands being supportive enough to respond to this study may be one of the factors influencing why the female patients with PDD, ASD, or ADHD traits were able to maintain their marital relationships and had higher marital relationship satisfaction with their husbands.

Moreover, the husbands' ASRS exhibited a negative significant association with the patients' QMI. The patients with PDD in this study were significantly more likely to have an insecurely fearful style of attachment over other styles of attachment, which is consistent with the finding of Whiffen et al.,[31] therefore they avoided close relationships owing to their fear of rejection and distrust of others. Additionally, the husbands with ADHD traits in this study may have presented more externalizing behavior problems, based on the finding of Schipper et al.[44] Therefore, if the husbands failed to suppress their negative responses to the patients during their marital relationship problems because of their ADHD traits, the patients may have developed a fear of rejection by their husbands and distrust of them, which may have reduced their marital satisfaction.

No established treatment exists for PDD. Numerous psychosocial and biological factors seemingly contribute to PDD, therefore no single treatment is likely to be universally successful. Thus, Schramm et al.[13] proposed treatment strategies tailored to the risk and associated factor groups of the individual patient with PDD. Considering the discussion thus far, it may be important to consider the possibility that the husbands of female PDD patients with a low marital satisfaction may have ADHD traits and, if so, developing intervention strategies that focus on these traits may be necessary. The intervention strategies may increase marital satisfaction in female PDD patients, which may be expected to reduce their depressive symptoms.

This study had several limitations. First, our clinical sample was small. While recruiting both female patients with PDD and their husbands proved to be extremely difficult but worthwhile, our findings should be considered preliminary until replicated in a larger sample of female patients with PDD and their husbands. Second, our data are cross-sectional. ADHD and ASD represent developmental traits, therefore they logically precede marital satisfaction; nevertheless, we cannot exclude empirically a third factor explanation for these findings. Future research should examine the time sequence of marital relationships among female patients with PDD and their husbands to ensure the causal order.

Third, emotional and cognitive impairment in patients with chronic depression and/or comorbidity of other psychiatric disorders may have influenced the results of the self-administered AQ-J-21 and ASRS Part A. Although the correlation coefficients between the PHQ-9 scores of the patients with PDD and both the AQ-J-21 and ASRS Part A of the patients was not significant, as presented in Table 3, not all of the aforementioned influences were able to be considered. To address these limitations, a similar survey must be conducted with nonclinical samples targeting a large population that considers structural equation modeling and includes the Beck depression scale-II,[45] which is superior to the PHQ-9 as a severity assessment. Fourth, although ASD and ADHD share a high rate of co-occurrence,[46] we could not examine the association between the ASD and ADHD traits with marital satisfaction separately for co-occurring and nonco-occurring cases. Fifth, it is important to note that this study did not conduct interviews targeting the patients' husbands, therefore we do not know whether the husbands had ASD or ADHD. As a result, the husbands' results cannot be compared with the previous findings of patients with ASD or ADHD.[26–29] Sixth, a potential selection bias may have arisen. Although this study incorporated a continuous sample from multiple medical institutions, there are couples wherein the female patients with PDD and their husbands were not willing to be recruited into the study at all (unknown number of couples), along with cases wherein they were recruited but did not agree to participate in the study (21 couples),

TABLE 1b Demographic and clinical characteristics of couples in which both the patients and their husbands responded

Characteristic		Patients (n = 28)	Husbands (n = 28)	P[a]
Age (years)	Median (IQR)	43.5 (38–53)	46.5 (42–55)	0.341
Marital duration (years)	Median (IQR)	15.0 (6–20)		
Educational status				
High school		8 (28.6%)	9 (32.1%)	0.480
Vocational school		4 (14.3%)	4 (14.3%)	
Junior college		3 (10.7%)	0 (0.0%)	
College/Graduate		13 (46.4%)	15 (53.6%)	
Employment status				
Employed full-time		5 (17.9%)	26 (92.9%)	<0.001
Employed part-time		3 (10.7%)	0 (0.0%)	
Suspension from office		3 (10.7%)	0 (0.0%)	
Housewife		13 (46.4%)	0 (0.0%)	
Lacking a job		4 (14.3%)	2 (7.1%)	
Duration of PDD (years) [only patients]	Median (IQR)	12.5 (6–19)		
Comorbid mental disorders [only patients]	*N* (%)			
ASD		2 (7.1%)		
ADHD		2 (7.1%)		
Major depressive disorder		15 (53.6%)		
Social anxiety disorder		1 (3.6%)		
Panic disorder		4 (14.3%)		
Agoraphobia		1 (3.6%)		
Generalized anxiety disorder		1 (3.6%)		
Obsessive-compulsive disorder		1 (3.6%)		
Post-traumatic stress disorder		5 (17.9%)		
Somatic symptom and related disorders		3 (10.7%)		
Family income (yen)[b]				
<1 million		2 (7.1%)		
1–2 million		0 (0.0%)		
2–4 million		7 (25.0%)		
4–6 million		2 (7.1%)		
6–8 million		9 (32.1%)		
≥8 million		8 (28.6%)		
PHQ-9	Median (IQR)	17.0 (9–21)	3.5 (1–7)	<0.001
QMI	Median (IQR)	18.0 (14–21)	19.0 (17–22)	0.164
RQ				
Secure		2 (7.1%)	10 (35.7%)	0.004
Dismissing		2 (7.1%)	4 (14.3%)	
Preoccupied		7 (25.0%)	9 (32.1%)	
Fearful		17 (60.7%)	5 (17.9%)	

(Continues)

TABLE 1b (Continued)

Characteristic		Patients (n = 28)	Husbands (n = 28)	P[a]
AQ-J-21	Median (IQR)	11.0 (9–15)	10.0 (7–12)	0.134
AQ-J-21 ≥ 12	N (%)	13 (46.4%)	10 (35.7%)	0.587
ASRS Part A	Median (IQR)	3.0 (2–4)	1.0 (0–3)	0.046
ASRS Part A ≥ 4	N (%)	10 (35.7%)	6 (21.4%)	0.375

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; AQ-J-21, Autism Spectrum Quotient-Japanese version-21; ASD, autism spectrum disorder; ASRS Part A, Adult Self-Report Scale Part A; IQR, interquartile range; PDD, persistent depressive disorder; PHQ-9, Patient Health Questionnaire-9; QMI, Quality Marriage Index; RQ, Relationship Questionnaire.

[a]P is calculated using Wilcoxon's rank-sum test and Fisher's exact test between the value obtained for the patients and that of their husbands.

[b]Family income was asked only for the patients.

TABLE 2a The correlation coefficient of patients' QMI

r (95% CI)[a]	In all patients (n = 37)	In patients whose husbands responded (n = 28)
Patients		
AQ-J-21	0.33 (0.00, 0.59)[b]	0.49 (0.13, 0.73)[b]
ASRS Part A	0.22 (−0.11, 0.51)	0.38 (0.00, 0.66)[b]
Husbands		
AQ-J-21	-	−0.17 (−0.51, 0.22)
ASRS	-	−0.40 (−0.67, −0.03)[b]
QMI	-	0.46 (0.10, 0.71)[b]

Abbreviations: AQ-J-21, Autism Spectrum Quotient-Japanese version-21; ASRS Part A, Adult ADHD Self-Report Scale Part A; QMI, Quality Marriage Index.

[a]95% CI = 95% confidence interval.

[b]Statistical significance was set at P < 0.05.

TABLE 2b Results of a nonhierarchical multiple regression analysis for the QMI with PHQ-9 score as the controlling variable

1 β[a] (95% CI)[b]	In all patients (n = 37)	In patients whose husbands responded (n = 28)
Patients		
AQ-J-21	0.34 (0.02, 0.67)[c]	0.49 (0.14, 0.85)[c]
ASRS Part A	0.28 (−0.07, 0.63)	0.45 (0.07, 0.84)[c]
Husbands		
AQ-J-21	-	−0.15 (−0.53, 0.24)
ASRS Part A	-	−0.37 (−0.74, −0.01)[c]
QMI	-	0.45 (0.11, 0.79)[c]

Abbreviations: AQ-J-21, Autism Spectrum Quotient-Japanese version-21; ASRS Part A, Adult ADHD Self-Report Scale Part A; PHQ-9, Patient Health Questionnaire-9; QMI, Quality Marriage Index.

[a]Standardized partial regression coefficient.

[b]95% CI = 95% confidence interval.

[c]Statistical significance was set at P < 0.05.

TABLE 3 The correlation coefficient of patients' PHQ-9

r (95% CI)[a]	In all patients (n = 37)	In patients whose husbands responded (n = 28)
Patients		
AQ-J-21	0.08 (−0.25, 0.39)	0.03 (−0.35, 0.40)
ASRS Part A	0.28 (−0.05, 0.55)	0.29 (−0.10, 0.59)
QMI	−0.14 (−0.44, 0.20)	−0.12 (−0.47, 0.27)
Husbands		
AQ-J-21	-	−0.29 (−0.59, 0.10)
ASRS Part A	-	−0.14 (−0.49, 0.25)
QMI	-	0.12 (−0.27, 0.47)

Abbreviations: AQ-J-21, Autism Spectrum Quotient-Japanese version-21; ASRS Part A, Adult ADHD Self-Report Scale Part A; PHQ-9, Patient Health Questionnaire-9; QMI, Quality Marriage Index.

[a]95% CI = 95% confidence interval.

and wherein only female patients with PDD agreed to participate in the study while their husbands did not (nine couples). The PDD-patient couples who did not agree to participate in this study might have greater marital problems than those who did agree to participate in this study.

Finally, the correlation coefficient between QMI and AQ-J-21 in all patients and that between QMI and ASRS in patients whose husbands responded, or their husbands are statistically significant, but very weak. Hence, our conclusions are not sufficiently convincing.

CONCLUSIONS

These data represent an investigation of the association between the ASD or ADHD traits of patients and their husbands, and the marital satisfaction of female patients with PDD. Our findings suggest that patients' ASD or ADHD traits exhibit a positive association with their marital relationship satisfaction and, by contrast, the ADHD traits of

the patients' husbands play a negative role in the marital satisfaction of the female patients with PDD. Considering the importance of support for PDD patients from their husbands based on healthy marital relationships, the implementation of interventions focused on ADHD traits of the husbands of female PDD patients with low marital satisfaction (if the husband has ADHD traits) may be important. Our preliminary data suggests one possible intervention, as discussed above. However, our conclusions are not sufficiently convincing, which is a limitation of our study.

AUTHOR CONTRIBUTIONS

Conceptualization: Y.T., M.K., J.O., J.K., and H.M. Funding acquisition: Y.T. Participant enrollment: Y.T., M.K., T.W., A.Y., J.O., N.T., J.K., and T.A. Data collection: Y.T. Statistical analysis: H.H. Data interpretation: Y.T., M.K., T.W., and T.A. Supervision: Y.T., H.M., and T.A. Writing—original draft preparation: Y.T. Writing—review and editing: Y.T., M.K., T.W., A.Y., H.H., J.O., N.T., J.K., H.M., and T.A. All authors have read and agreed to the published version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Research data will not be shared, as the participants did not consent to open data sharing.

ETHICS APPROVAL STATEMENT

This research was conducted in accordance with the principles of the Declaration of Helsinki. The study was approved by the Medical Ethics Committee of Nagoya City University School of Medicine, Toyokawa City Hospital, Kusunoki Mental Hospital, and Gifu Hospital.

PATIENT CONSENT STATEMENT

All participants voluntarily agreed to participate by clicking an "I agree" button in the electronic questionnaire after reading a guide explaining the study's purpose, response period, data storage mechanism, and that the responses would be kept confidential.

CLINICAL TRIAL REGISTRATION

The study was registered in the Japanese clinical trials registry (UMIN 000043759).

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