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Neuroticism mediates the association between childhood abuse and the well-being of community dwelling adult volunteers

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Abstract

Background Previous studies reported that the experience of maltreatment in childhood reduces subjective well-being in adulthood and that neuroticism is negatively associated with subjective well-being. However, the interrelationship between childhood maltreatment, adult life events, neuroticism, and subjective well-being has not been analyzed to date.

Methods A total of 404 adult volunteers provided responses to the following questionnaires: 1) Childhood Abuse and Trauma Scale, 2) Life Experiences Survey, 3) Neuroticism Subscale of the Shortened Eysenck Personality Questionnaire-Revised, and 4) Subjective Well-Being Inventory. The path model was used to analyze possible interrelationships among these parameters.

Results The effect of childhood abuse on subjective well-being was indirect and was mediated by neuroticism. The effect of neuroticism on the negative, but not positive, change score on the Life Experiences Survey was significant. The indirect effect of neuroticism on subjective well-being was not significant via either negative or positive change scores.

Conclusions This study demonstrated that age, subjective social status, neuroticism, and negative and positive life events were significantly associated with subjective well-being. Furthermore, using path analysis, we demonstrated the mediating role of neuroticism in the indirect effect of childhood abuse on subjective well-being.

Keywords Childhood abuse, Subjective well-being, Neuroticism, Mediating effect, Path analysis

Background

The World Health Organization states that “health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” [1]. Therefore, when aiming to be healthy, people should take care to maintain not only their physical condition but also their mental condition in a good state. Recently, it has been demonstrated that an individual’s experience of maltreatment in childhood interferes with the maintenance of mental well-being in adulthood [2, 3]. Maltreatment in childhood is associated with mental unstableness, including self-injury and suicidality [4].

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The experience of maltreatment in childhood often induces mental disorders after the victims become adults, which then lead to a deterioration in their well-being [5]. Consistent with these findings, a previous study showed that childhood maltreatment worsened well-being in adulthood of adult volunteers [6].

Individuals who were exposed to maltreatment during middle childhood reportedly have more emotional dysregulation [7]. There is a complex association between childhood maltreatment and adult personality traits [8]. Exposure to psychological trauma in childhood is associated with stress reactivity, which is associated with a mixture of depressive, anxiety, and psychotic symptoms [9]. Maltreatment in childhood is known to be a risk factor for psychopathology in both childhood and adulthood, and various types of maltreatment in childhood have been suggested to be associated with the severity of psychological distress in adulthood [10]. Furthermore, childhood maltreatment in addition to inadequate parenting is associated with high neuroticism [11–13], and neuroticism is also associated with reduced well-being [14, 15].

Among the various personality traits, neuroticism is a major candidate as a predisposing factor of several mental disorders [16, 17]. The close association between neuroticism and depression has been thoroughly investigated, and it has been shown that neuroticism precedes the onset of major depression and that it increases the prevalence of major depression together with severe stressful life events, i.e., psychological stressors [18]. Our previous studies using structural equation modeling showed that the effects of childhood maltreatment on the development of depressive symptoms in adulthood upon exposure to stressful life events were mediated by increased neuroticism [11]. Other personality traits, such as affective temperament and the 7 dimensions of Temperament and Character Inventory, are correlated with neuroticism [19] and have been reported to mediate the association between childhood stress and well-being [6, 20]. Therefore, such a mediating role of personality traits between childhood maltreatment and well-being may also apply to neuroticism.

Based on the above background, we hypothesized that childhood abuse, adult life events, and neuroticism are interrelated and affect subjective well-being in adulthood. In this study, we sought to verify our hypothesis by analyzing interrelationships among the scores of Childhood Abuse and Trauma Scale (CATS), Life Experiences Survey (LES), Neuroticism Subscale of the Shortened Eysenck Personality Questionnaire-Revised (EPQ-R), and Subjective Well-Being Inventory (SUBI), using the path model.

Methods

Subjects

This study is a part of a larger study conducted on 853 Japanese adult volunteers from a community dwelling population [6]. Of the 853 volunteers, 404 (47.4%) completed the questionnaires (220 men and 184 women; age 20 to 81 years (42.3 ± 11.9 years [average \pm standard deviation])). Four questionnaires and a questionnaire on demographic characteristics (sex, age, marital status, family members, employment status, education, past and family history of physical and psychiatric diseases, and subjective stratum identification) were distributed to the subjects. Written informed consent was obtained from all of the subjects after explaining the following: 1) participation in this research is completely voluntary, 2) refusal to participate will result in no disadvantage, and 3) the collected information will be kept strictly confidential.

Questionnaires

Child Abuse and Trauma Scale (CATS)

The CATS is a scale that consists of 38 items. It has strong test–retest reliability ($r=0.71$ to 0.91) and internal consistency (Cronbach's $\alpha=0.63$ to 0.90) [21]. The scores significantly correlate with outcome measures, such as depression, dissociation, interpersonal difficulties, and stressful life events. Regarding each item, the participants rate the frequency of their experience of a particular abusive experience during childhood and adolescence using a scale ranging from 0 to 4 (0 = never; 4 = always). The total score of the CATS was used for analysis in this study.

The Japanese version of the CATS was developed and validated by the translation-back translation method. Permission of use and confirmation were obtained from the original developer of the CATS [22].

Life Experiences Survey (LES)

The LES is a scale consisting of 57 items. The respondents indicate the events that they have experienced within the past year [23], and they rate the effects and desirability of the events. More precisely, they indicate the events that they have experienced during the past year (within the previous 6 months and between the previous 7 months to 1 year), and (a) if they consider the event as a positive or negative experience, and (b) the degree that the particular event impacted their life when it happened. The events are rated on a 7-point scale, ranging from extremely positive to extremely negative. The sum of the impact ratings of the events that were considered as a positive experience is a *positive change score*, and the sum of the impact ratings of the events that were considered as a negative

experience is a *negative change score*. The Japanese version of the LES was used in this study [24].

Neuroticism subscale of the shortened Eysenck Personality Questionnaire-Revised (EPQ-R)

Neuroticism was measured using the subscales of the shortened version of the Japanese EPQ-R [25]. Several studies have reported an association between neuroticism and major depression or depressive symptoms [18]. The validity and reliability of the shortened Japanese version of EPQ-R were confirmed in a previous study [26].

Subjective Well-Being Inventory (SUBI)

The SUBI is a self-report measurement that consists of 40 items to estimate subjective well-being (life satisfaction, happiness, etc.) and ill-being (anxiety, worry, deficiency in social contacts, etc.) [27]. The scores for all questions range from 1 to 3. Those with low scores can be interpreted as being in a less favorable state. Tonan et al. have confirmed the reliability and validity of the Japanese version of the SUBI [28]. In this study, total score of subjective well-being was used for the analysis.

Data analysis

A structural equation model was designed in which childhood abuse predicted the subjective well-being scores of the SUBI.

Mplus version 8.5 (Muthén & Muthén, Los Angeles, CA, USA) was used to perform the path analysis to obtain the direct and indirect effects of all variables. Then, the robust maximum likelihood estimation method was used to analyze the model. To statistically evaluate the structural equation modeling, the indices of goodness of fit using the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) were calculated. In accordance with the conventional criteria, a CFI greater than 0.95 and an RMSEA less than 0.08 were considered to suggest an acceptable fit; and a CFI greater than 0.97 and an RMSEA less than 0.05 was considered to suggest a good fit [29]. All coefficients were standardized and used for covariance structure analysis.

The student's *t*-test was used to compare data between groups, and the Pearson correlation coefficient was calculated to analyze correlations between data. Using the forced entry method, multiple regression analysis was conducted with the subjective well-being score of the SUBI as a dependent variable, and the following 7 variables as independent variables: age, subjective social status (lowest = 10, to highest = 1), education (years), EPQ-R neuroticism score, total average scores of the CATS, and positive and negative change scores of the LES.

Statistical analyses were conducted using SPSS 28.0 J (IBM, Armonk, NY, USA) and Mplus version 8.5. the

level of statistical significance was set at a *p*-value of less than 0.05.

Results

Demographic characteristics and the CATS, LES, EPQ-R, and SUBI well-being score

The demographic characteristics and CATS, LES, EPQ-R, and SUBI well-being scores of the 404 subjects are shown in Table 1. The correlation coefficient between each psychological scale is shown in Table 2. Age, education (years), subjective social status, EPQ-R neuroticism score, total scores of the CATS, and the positive and negative change scores of the LES were significantly associated with the subjective well-being scores of the SUBI assessed by the Pearson correlation coefficient and the Student *t*-test (Table 1).

Multiple regression analysis of the subjective well-being score of the SUBI using the forced entry method

The putative variables in Table 1 that showed significant correlations with subjective well-being score of the SUBI, as assessed by the Pearson correlation coefficient, or which had significant effects on the subjective well-being score of the SUBI, as determined by the Student *t*-test, were analyzed further by multiple-regression analysis.

The results of multiple regression analysis are shown in Table 3. The subjective well-being score of the SUBI was the dependent factor, and education (years), age, subjective social status (highest = 1 to lowest = 10), EPQ-R neuroticism score, total average scores of the CATS, and positive and negative change scores of the LES were independent factors. Age, subjective social status, EPQ-R neuroticism score, and negative and positive change scores of the LES were found to be significant predictors of the subjective well-being score of the SUBI ($F = 16.93$, $P < 0.001$, adjusted $R^2 = 0.221$). The correlations of subjective well-being score of the SUBI with total average scores of the CATS, and education (years) were not significant. Multicollinearity was denied in the multiple regression analysis with the maximum value of VIFs in this model, 1.210 for CATS.

Path model analysis

To analyze the association between childhood abuse (CATS average total score), negative and positive change score of the LES, neuroticism (EPQ-R), and subjective well-being score of the SUBI, we built a path model based on the results of the above univariate analyses and multiple regression analyses (Fig. 1). Figure 1 shows the results of the path coefficients calculated by Mplus software.

An acceptable fit of the model (Fig. 1) was obtained based on the following criteria: CFI = 0.987 and

Table 1 Characteristics, CATS, EPQ-R, and LES scores, and their correlation with SUBI subjective well-being scores or effects on SUBI subjective well-being scores in 404 adult volunteers

Characteristic or Measure	Value (number or mean \pm SD)	Correlation with SUBI subjective well-being scores (<i>r</i>) or effect on them (mean \pm SD of subjective well-being scores, <i>t</i> -test)
Age	42.3 \pm 11.9	$r = -0.16^{**}$
Sex (male: female)	220: 184	Male 39.4 \pm 6.6 vs female 38.8 \pm 6.2, n.s. (<i>t</i> -test)
Education, years	15.2 \pm 2.0	$r = 0.16^{**}$
Employment status (employed: unemployed)	341: 56	Employed 39.0 \pm 6.3 vs unemployed 39.6 \pm 7.4, n.s. (<i>t</i> -test)
Marital status (married: unmarried)	287: 114	Married 39.3 \pm 6.3 vs unmarried 38.4 \pm 6.4, n.s. (<i>t</i> -test)
Number of cohabiters	1.8 \pm 1.5	$r = 0.010$, n.s.
Number of offspring	1.3 \pm 1.2	$r = 0.004$, n.s.
Comorbidity of physical disease (yes: no)	81: 319	Yes 38.2 \pm 6.3 vs no 39.4 \pm 6.4, n.s. (<i>t</i> -test)
1st-degree relative with psychiatric diseases (yes: no)	40: 362	Yes 37.7 \pm 7.1 vs no 39.3 \pm 6.3, n.s. (<i>t</i> -test)
Subjective social status score	4.9 \pm 1.5	$r = -0.21^{**}$
EPQ-R neuroticism score	3.6 \pm 3.2	$r = -0.37^{**}$
SUBI subjective well-being score	39.1 \pm 6.4	
CATS total average score	0.65 \pm 0.43	$r = -0.23^{**}$
LES (change score)	Negative 1.65 \pm 3.09	$r = -0.17^{**}$
	Positive 1.67 \pm 2.95	$r = 0.15^{**}$

Notes: Data are presented as means \pm standard deviation (SD) or numbers

Abbreviations: CATS Child Abuse and Trauma Scale, EPQ-R Eysenck Personality Questionnaire revised, LES Life Experiences Survey, SUBI Subjective Well-Being Inventory
n.s. not significant

r = Pearson correlation coefficient

** $P < 0.01$

Table 2 Pearson correlation coefficients between SUBI well-being score, CATS total average score, LES positive score, LES negative score, and EPQ-R neuroticism score

	SUBI subjective well-being score	CATS total average score	LES positive change score	LES negative change score	EPQ-R neuroticism score
SUBI subjective well-being score	1	-0.225**	0.151**	-0.166**	-0.384**
CATS total average score	-0.225**	1	-0.011	0.124*	0.359**
LES positive change score	0.151**	-0.011	1	0.135**	-0.041
LES negative change score	-0.166**	0.124*	0.135**	1	0.208**
EPQ-R neuroticism score	-0.384**	0.359**	-0.041	0.208**	1

SUBI Subjective Well-Being Inventory, CATS Child Abuse and Trauma Scale, LES Life Experiences Survey, EPQ-R Eysenck Personality Questionnaire revised

* $P < 0.05$

** $P < 0.01$

RMSEA = 0.056. The path coefficients with solid lines in Fig. 1 were significant ($P < 0.01$ – 0.001). The subjective well-being score of the SUBI was significantly and directly predicted by neuroticism and the negative and positive change scores of the LES. The effect of childhood abuse on subjective the well-being score of the SUBI was indirect and was significantly mediated by neuroticism (indirect path coefficient = -0.115 ,

$P < 0.001$). The effect of childhood abuse on the negative change score of the LES was also indirect and mediated by neuroticism (indirect path coefficient = 0.067 , $P < 0.01$). However, neither the direct or indirect effect of childhood abuse on the positive change score of the LES was significant. On the other hand, the effect of neuroticism on the negative, but not positive, change score of the LES was significant.

Table 3 Results of multiple regression analysis of SUBI subjective well-being scores

Independent factor	Beta	P-value	VIF
EPQ-R neuroticism score	-0.325	< 0.001	1.205
Age	-0.178	< 0.001	1.187
Subjective social status	-0.119	0.012	1.134
Positive change score of LES	0.109	0.018	1.069
Negative change score of LES	-0.095	0.040	1.079
CATS total average score	-0.089	0.070	1.210
Education (years)	0.026	0.593	1.235
Adjusted $R^2 = 0.221$			

Abbreviations: CATS Child Abuse and Trauma Scale, EPQ-R Eysenck Personality Questionnaire revised, LES Life Experiences Survey, SUBI Subjective Well-Being Inventory

Beta = standardized partial regression coefficient

Dependent factor: SUBI subjective well-being score

Independent factors: age, education (years), subjective social status (lowest = 10 to highest = 1), total average scores of CATS, EPQ-R neuroticism score, and negative and positive change scores of LES

Furthermore, the indirect effect of neuroticism on the subjective well-being score of the SUBI for both the negative and positive change scores of the LES was not significant. The squared multiple correlation coefficient for subjective well-being scores of the SUBI was 0.189; i.e., this model accounts for 18.9% of the variability of subjective well-being.

Discussion

To the best of our knowledge, this is the first study to show that childhood abuse indirectly decreases subjective well-being and that neuroticism is a mediator in this interrelationship. Using a path analysis for the data of 404 adult community dwelling volunteers, we showed that the EPQ-R neuroticism score and LES negative and positive change scores directly predict subjective well-being. Because there is a long interval between abuse in childhood and subjective well-being in adulthood, the existence of a mediator that connects these events is highly likely, and clarifying the role of the mediator will provide answers to clinical questions regarding how events that people experienced in the distant past can influence their present health.

The most important finding of this path model study is that the path analysis suggested that childhood abuse is an indirect, significant predictor of subjective well-being, although multiple regression analysis did not. If we had only performed multiple regression analysis, we might have come to the erroneous conclusion that childhood abuse is not significantly associated with subjective well-being. Our results demonstrate that the most powerful advantage of the path analysis is that it has the ability to identify indirect effects. Childhood abuse is associated with higher neuroticism [11–13]. Furthermore, neuroticism is closely associated with subjective well-being [14, 15, 30]. Even during the COVID-19

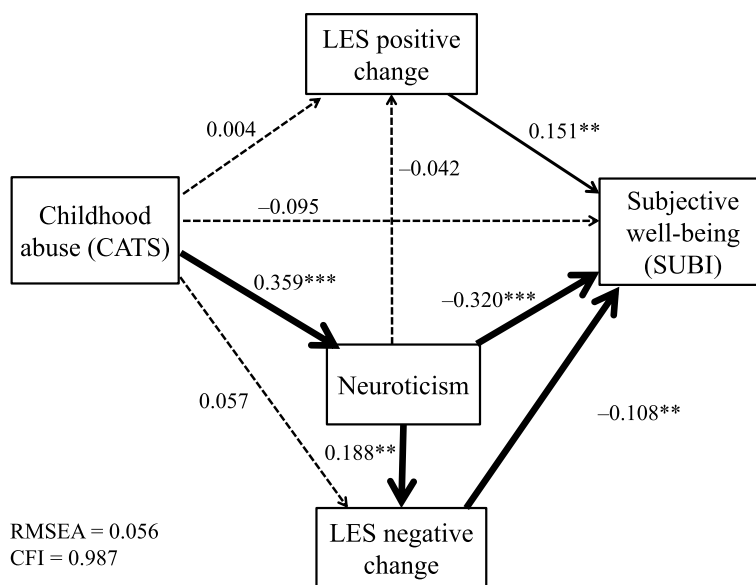


Fig. 1 Results of covariance structure analysis in the path model, using the childhood abuse score (CATS total), neuroticism score (EPQ-R), negative and positive change scores of life events (LES), and subjective well-being score of the SUBI from 404 nonclinical adult volunteers. The arrows with solid lines represent the statistically significant paths, and those with broken lines represent the nonsignificant paths. The numbers beside the arrows show the standardized path coefficients (minimum - 1, maximum = 1). ** $P < 0.01$, *** $P < 0.001$. CATS, Child Abuse and Trauma Scale; EPQ-R, Eysenck Personality Questionnaire-revised; LES, Life Experiences Survey; SUBI, Subjective Well-Being Inventory

pandemic, extraversion was not significantly correlated with well-being, whereas neuroticism remained strongly associated with reduced well-being [31]. Of the 5 personality factors, neuroticism is the most strongly correlated with reduced well-being [32, 33]. This was also recently confirmed in COVID-19-associated studies [34, 35]. Regarding the mediating effect of neuroticism, several studies demonstrated that neuroticism has a mediating role in the effects of adversity in childhood on adulthood depressive symptoms [6, 11–13, 36, 37]. Because there was a negative association between depressive symptoms and subjective well-being [6], these findings are supported by the results of the present study. Our previous studies also suggested that adverse childhood experiences such as abuse and parental bonding are perceived as being inadequate and affect subjective well-being through the mediating effect of various personality traits, such as those measured by the Temperament Evaluation of Memphis, Pisa, Paris and San Diego-autoquestionnaire version (TEMPS-A), and Temperament and Character Inventory (TCI) [6, 20]. Because subcategories of the TEMPS-A and TCI are closely associated with neuroticism [19], these previous findings are also supported by the results of the present study. Another of our previous studies suggested that neuroticism mediates the effect of childhood victimization on adulthood presenteeism in the workplace [38]. Experience of frequent work-associated bullying in adulthood was found to be associated with increased neuroticism, and the shift from a “bullied” to a “non-bullied” situation decreased neuroticism [39]. This finding may explain the mechanism of the mediating effect of neuroticism. Taken together, these previous findings and the findings of our present study indicate that both the experience of childhood trauma and traumatic events in adulthood influence subjective well-being in adulthood.

The necessity of treatment for patients who experienced child abuse is well known, and various forms of psychotherapy, such as trauma-focused cognitive behavioral therapy (TF-CBT), have been developed for such patients [40]. A clinical trial that investigated the efficacy of animal-assisted therapy (AAT) as an adjunct to TF-CBT was conducted recently, although AAT was not warranted at this time [41]. In addition to focusing on treating child abuse, we wish to focus on treating neuroticism. Because our present study suggested that neuroticism has an inhibitory mediating effect on subjective well-being in the nonclinical adult population, this knowledge may contribute to improving clients' current subjective well-being by improving the treatment of neuroticism. Because neuroticism is a natural temperament, treating it may be considered unusual. However, opposite to theoretical conceptions of personality, recent research

suggests that neuroticism is changeable over time and that it responds to treatment; i.e., neuroticism can be reduced by direct interventions [42]. Psychological treatments, such as mindfulness-based cognitive therapy, have demonstrated a significant reduction in neuroticism [43]. Another effective intervention is pharmacological intervention. Serotonergic drugs appear to induce negative effects on neuroticism, whereas noradrenergic drugs enhance extroversion [42, 44, 45]. The fact that both psychological and pharmacological interventions are effective in treating neuroticism suggests that some biopsychosocial mechanism underlies the results of the present study.

Recent progress in genomic research has shed light on this research field. A twin polygenic study suggested that genetic scores of neuroticism are associated with the risk of experiencing abuse, and this inherited genetic risk partially explains the association of neuroticism and childhood abuse [46]. Another genetic study using the genomewide association method identified genetic variants that are associated with neuroticism, depressive symptoms, and low subjective well-being [47]. Furthermore, a recent genomewide association study conducted on 329,821 individuals identified 116 independent gene variants that influence neuroticism [48]. These genetic findings may partially explain the links between childhood abuse, neuroticism, and well-being. Further biological studies are needed to clarify the mechanism underlying the mediating role of neuroticism in the effect of the experience of abuse in childhood on well-being in adulthood.

The present study has several limitations. Firstly, the sample was a nonclinical adult population. Therefore, the findings may not be directly applicable to patients with psychiatric disorders. The mediating effect of neuroticism between childhood abuse and subjective well-being should be studied prospectively in the future using a larger number of subjects, including psychiatric patients. Secondly, in this study, childhood abuse was reported retrospectively. Therefore, it relied on the subjects' memory and self-declaration. To verify the influence of childhood abuse on subjective well-being, a prospective study of a birth cohort in which childhood abuse is objectively evaluated is needed.

Conclusion

In this study, we demonstrated that age, subjective social status, neuroticism, and negative and positive life events were significantly associated with subjective well-being. Furthermore, using path analysis, we clarified the mediating role of neuroticism in the indirect effect of childhood abuse on subjective well-being.

Abbreviations

CATS	Childhood Abuse and Trauma Scale
LES	Life Experiences Survey
EPQ-R	Neuroticism Subscale of the Shortened Eysenck Personality Questionnaire-Revised and
SUBI	Subjective Well-Being Inventory

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Authors' contributions

YF and TI designed the study, wrote the protocol, and collected and analyzed the data. All authors contributed to data analysis, drafting and critically revising the paper, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

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Availability of data and materials

Detailed data are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethics approval was obtained from the Institutional Review Boards of Hokkaido University Hospital and Tokyo Medical University (study approval no. 013-0184 and SH3308, respectively).

Consent for publication

Written informed consent was obtained from all participants prior to their enrollment in the study.

Competing interests

Yota Fujimura has received honoraria from Sumitomo Pharma and research and grant support from Otsuka Pharmaceutical, Sumitomo Pharma, and Shionogi. Akiyoshi Shimura has received lecture fees from Sumitomo Pharma and Eisai. Yu Tamada has received honoraria from Otsuka Pharmaceutical, Sumitomo Pharma, Eisai, MSD, and Meiji Seika Pharma. Ichiro Kusumi has received honoraria from Eisai, Eli Lilly, Janssen Pharmaceutical, Meiji Seika Pharma, Mochida Pharmaceutical, Novartis Pharma, Otsuka Pharmaceutical, Shionogi, Sumitomo Pharma, Takeda Pharmaceutical, Viartis, and Yoshitomiya and has received research/grant support from Asahi Kasei Pharma, Astellas, Daiichi Sankyo, Eisai, Eli Lilly, Mochida Pharmaceutical, Nihon Medi-Physics, Otsuka Pharmaceutical, Pfizer, Shionogi, Sumitomo Pharma, Takeda Pharmaceutical, and Tanabe Mitsubishi Pharma. Takeshi Inoue is a member of the advisory boards of Pfizer, Novartis Pharma, and Mitsubishi Tanabe Pharma and has received personal fees from Mochida Pharmaceutical, Takeda Pharmaceutical, Eli Lilly, Janssen Pharmaceutical, MSD, Taisho Toyama Pharmaceutical, Yoshitomiya, and Daiichi Sankyo; grants from Shionogi, Astellas, Tsumura, and Eisai and grants and personal fees from Otsuka Pharmaceutical, Dainippon Sumitomo Pharma, Mitsubishi Tanabe Pharma, Kyowa Pharmaceutical Industry, Pfizer, Novartis Pharma, and Meiji Seika Pharma. The other authors declare that they have no actual or potential conflicts of interest associated with this study.

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