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ORIGINAL RESEARCH

Effects of Inappropriate Nurturing Experiences, Depressive Rumination, and Trait Anxiety on Depressive Symptoms

Yunosuke Usui[1], Miki Ono[1], Rintaro Nibuya[1], Masayuki Kikkawa[1], Shunichiro Ito[1], Chihiro Morishita[1], Mina Honyashiki[1], Yu Tamada[1,2], Takeshi Inoue[1], Jiro Masuya[1]

[1]Department of Psychiatry, Tokyo Medical University, Shinjuku-ku, Tokyo, Japan; [2]Department of Psychiatry, Tokyo Medical University Hachioji Medical Center, Hachioji-shi, Tokyo, Japan

Correspondence: Jiro Masuya, Department of Psychiatry, Tokyo Medical University, 6-7-1 Nishi-shinjuku, Shinjuku-ku, Tokyo, 160-0023, Japan, Tel +81-(0)3-3342-6111, Email j-masuya@tokyo-med.ac.jp

Background: Prior research has shown that inappropriate childhood nurturing experiences (low care and high overprotection), trait anxiety, and depressive rumination are risk factors for depression. However, no studies to date have analyzed the overall association between these factors and depressive symptoms. In the present study, we hypothesized that depressive rumination mediates the impacts of inappropriate childhood nurturing experiences on depressive symptoms, and that these mediating effects are moderated by trait anxiety, and tested these hypotheses in adult volunteers.

Methods: The subjects were adult volunteers who were investigated between April 2017 and April 2018. A self-report questionnaire on demographic data, childhood nurturing experiences, trait anxiety, depressive rumination, and depressive symptoms was distributed to conduct the survey, and written informed consent and valid responses were obtained from 585 subjects. Mediation and moderated-mediation analyses were performed by SPSS 28 and macro PROCESS 4.0 software. This study was approved by the Ethics Committee of Tokyo Medical University.

Results: Parental care showed a significant negative indirect effect on depressive symptoms via its effect on depressive rumination ($p < 0.01$), whereas parental overprotection showed the opposite effect ($p < 0.01$). Furthermore, the mediation effect of depressive rumination on depressive symptoms was increased by trait anxiety ($p < 0.05$).

Conclusion: Our present study demonstrated that the main factor affecting depressive symptoms is inappropriate childhood nurturing experiences, which indirectly enhance depression by intensifying depressive rumination, and that depressive rumination and trait anxiety mutually reinforce each other to enhance depressive symptoms. These findings may be useful for the prevention of depressive symptoms. Large-scale prospective studies are needed to confirm the causal associations among these factors in the future.

Keywords: childhood parenting experiences, depressive rumination, trait anxiety, depressive symptoms, moderated-mediation analysis

Introduction

Depression is a common psychiatric disorder that causes depressed mood, low motivation, anxiety, insomnia or hypersomnia, and a decrease or increase in appetite over a long period of time.[1] Although the causes of depression have not been fully clarified to date, environmental factors, such as inappropriate nurturing from parents (low care and high overprotection), abuse, and bullying victimization by peers during childhood and harassment in adulthood are reported risk factors for the onset of depression.[2–8] Regarding environmental factors, several studies have reported that childhood stress, caused by factors such as inappropriate parental nurturing and abuse experienced during childhood, influences depression in adulthood via their effects on children's personality traits.[6,9–19] Cross-sectional studies have suggested that inappropriate nurturing experienced in childhood has long-term effects on depression and depressive symptoms in adulthood, particularly through its effects on personality traits, such as trait anxiety, neuroticism, self-

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esteem, interpersonal sensitivity, and affective temperaments.[9,13,18,20–22] The Parental Bonding Instrument (PBI), which is a widely used self-report questionnaire for the retrospective assessment of nurturing experiences, evaluates childhood nurturing experiences in terms of care and overprotection.[23] Previous studies using the PBI have reported that inappropriate parental nurturing during childhood influences depressive symptoms, and that its effects on depression vary depending on the type of nurturing experience.[2,6,13,24]

Depressive rumination is continuous negative thinking about one's own depressive symptoms, and the causes and consequences of depression.[25] Nolen-Hoeksema pointed out the importance of depressive rumination as a psychological pathogenic mechanism of depression and depressive symptoms, and rumination has recently received clinical attention and has been applied in the treatment of depression.[25–30] The influences of childhood experiences of abuse and peer victimization on depressive symptoms are mediated by their effects on depressive rumination.[9,31,32] Inappropriate childhood nurturing experiences are also known to affect depressive rumination in addition to depression.[6,13,18,29] A prospective study analyzed the effects of childhood experiences of inappropriate maternal nurturing on depression and depressive symptoms, and showed the mediation by depressive rumination.[33] However, a limitation of their study was that they did not analyze paternal nurturing. On the other hand, various factors may have a moderating effect on the mediating association of the inappropriate childhood nurturing experience-depressive rumination-depression triangle, but this has never been reported previously.[34]

Anxiety and depression are closely associated with each other.[35] In psychiatric disorders, anxiety and depression often coexist, but in most cases, anxiety precedes and depression follows.[36,37] In other words, anxiety is a risk factor for the development of depression.[37] High levels of trait anxiety, which is an anxiety-prone personality trait, make people more likely to develop depression and anxiety disorders.[38] The biological basis of trait anxiety is the well-studied neuroendocrine response of the hypothalamic-pituitary-adrenocortical system, which is associated with trait anxiety and an exaggerated response to stress load.[38] Psychologically, people who are more prone to trait anxiety may be more vulnerable to depression when exposed to a stressor, as the neurocognitive cascade associated with the body is stimulated, which increases susceptibility to stress, resulting in cognitive and behavioral changes.[38,39] Trait anxiety is also closely associated with depressive rumination, and trait anxiety and depressive rumination reportedly have a cascading mediating effect on the impacts of childhood abuse and bullying victimization on depressive symptoms.[9,32] Furthermore, trait anxiety is also associated with inappropriate childhood nurturing experience.[40] Because of the nature of trait anxiety as an individual stress response trait as described above, it is possible that trait anxiety may have a moderating effect on the mediating association of the inappropriate childhood nurturing experience-depressive rumination-depression triangle, but no studies have investigated the possibility of such a moderated-mediation effect.

As mentioned above, some of the associations among the 4 variables, ie, inappropriate childhood nurturing experience, trait anxiety, depressive rumination, and depression, have been reported in previous studies, but no studies to date have analyzed the overall associations among the 4 variables in terms of mediation and moderated-mediation effects. It is also necessary to analyze whether trait anxiety and depressive rumination differ in their impacts on depressive symptoms caused by the experience of inappropriate childhood nurturing, depending on the father and mother or care and overprotection, but this has not been fully clarified to date. For psychosocial analysis of these 4 complex variables, a combined model of mediation and moderation effects is useful, as described by Baron and Kenny.[34] In the present study, we conducted moderated-mediation analysis, hypothesizing that depressive rumination mediates the effects of inappropriate childhood nurturing experiences on depressive symptoms, and that trait anxiety moderates these mediating effects. This is because trait anxiety precedes depression and affects both depressive rumination and depression.[9,32,36,37]

Subjects and Methods

Subjects

A cross-sectional self-report questionnaire survey was conducted on adult volunteers between April 1, 2017 and April 30, 2018. The study subjects were recruited by convenience sampling. The study was part of a larger study.[9,32] Anonymous questionnaires were collected until September 30, manual data input from the paper questionnaires to a computer was completed on December 31, and databases were checked and cleaned up to April 30, 2018. A total of 597 adult volunteers participated in

this study, and 12 subjects were excluded owing to many missing data. A demographic questionnaire and 4 questionnaires on childhood nurturing, depressive rumination, trait anxiety, and depressive symptoms were administered. There were 585 subjects (249 men and 336 women; age: 41.7 ± 12.1 years) whose written consent was obtained and for whom valid responses were obtained anonymously. The inclusion criterion was an age of 20 years or older, and the exclusion criteria were not having any serious mental or physical illnesses. The subjects were informed that their participation in the study was voluntary, that they would not be disadvantaged in any way by nonparticipation, that their personal information would be completely anonymized, that their data would be kept strictly confidential, and that their personal information would be handled with the utmost care. This study was conducted in compliance with the Declaration of Helsinki (amended in 2013) and with the approval of the Ethics Committee of Tokyo Medical University (study approval no.: SH3502).

Questionnaires

Parental Bonding Instrument (PBI)

Adults were asked to recall their experiences as children, and their childhood nurturing experiences were assessed by the PBI Japanese version of the self-administered questionnaire.[23,41] The following 2 factors were rated for each of the father and mother: overprotection (13 items with a total of 0 to 39 points) and care (12 items with a total of 0 to 36 points). A higher overprotection score means that the subjects perceive their parents as being controlling, interfering, and indifferent, whereas a higher care score means that they perceive their parents as giving emotional warmth, empathy, and closeness. In the present study, the father's and mother's care and overprotection scores were used in the analysis. Cronbach's α coefficients calculated for the individual subscales of the PBI were found to be 0.866 for overprotection by the father, 0.920 for care by the father, 0.873 for overprotection by the mother, and 0.915 for care by the mother, and indicate excellent internal consistency.

Ruminative Responses Scale (RRS)

The RRS is a self-report questionnaire that measures how frequently the subjects experience depressive rumination.[42] The questionnaire consists of 22 items, and each item is rated on a 4-point scale (1 to 4 points). Higher total scores indicate more frequent depressive rumination. The Japanese version of the RRS was translated by Hasegawa, and its reliability and validity have been verified.[43] The Cronbach's α coefficient for the total score of this scale was 0.944, indicating excellent internal consistency.

State-Trait Anxiety Inventory Form Y (STAI-Y)

The STAI-Y is a self-report questionnaire that evaluates trait and state anxiety. For the present analysis, trait anxiety was used, which is a relatively stable response tendency to anxiety-provoking experiences. The trait anxiety section consisted of 20 items. The respondents were asked to rate how they usually feel using a 4-point scale (1 to 4 points).[44] Higher total scores indicate higher trait anxiety. The Japanese version was translated by Hidano et al, and its validity and reliability have been verified.[45] The Cronbach's α coefficient for the total score of the trait anxiety subscale was 0.925, indicating excellent internal consistency.

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a self-report depression rating scale.[46] Nine items of depressive symptoms experienced by the subject in the previous 2 weeks were rated using a 4-point scale (0 to 3 points). Total scores reflecting symptom severity were used for analysis in this study. The Japanese version of the PHQ-9 has been translated, and its validity and reliability have been verified.[47] The Cronbach's α coefficient for the total score of this scale was 0.854, indicating good internal consistency.

Statistical Analysis

In the present study, the effects of inappropriate childhood nurturing experiences (PBI) on depressive symptoms (PHQ-9) were hypothesized to be mediated by depressive rumination, and trait anxiety (STAI-Y) was hypothesized to moderate the effects of inappropriate childhood nurturing experiences and depressive rumination on depressive symptoms and the mediation effect of depressive rumination. The association and correlation of demographic information and questionnaire data, and the mediation and moderated-mediation analyses were conducted using SPSS 28 software (IBM, Armonk, NY, USA) and its macro PROCESS 4.0 (models 4 and 15). Model 4 was used for the mediation analysis, and Model 15 for the moderated-mediation analysis (Figure 1). In both models, age and sex were included in the analysis as covariates.

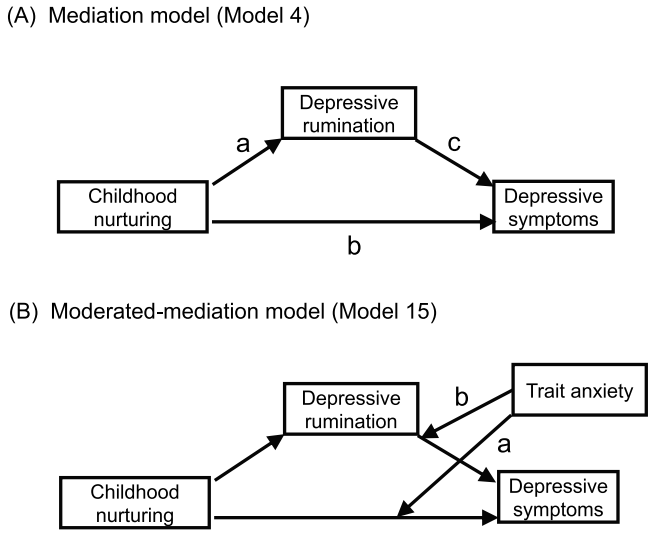

Figure 1 Mediation model (**A**, model 4) and moderated-mediation model (**B**, model 15) of inappropriate childhood nurturing experiences (PBI), trait anxiety (STAI-Y), depressive rumination (RRS), and depressive symptoms (PHQ-9). The data of (**A**) are shown in Table 2. The data of (**B**) are shown in Table 3. PBI, Parental Bonding Instrument; PHQ-9, Patient Health Questionnaire-9; RRS, Ruminative Responses Scale; STAI-Y, State-Trait Anxiety Inventory form Y.

Standardized coefficients were used for Model 4, and unstandardized coefficients were used for Model 15. A *p*-value of less than 0.05 was considered to indicate a statistically significant difference between groups.

Regarding the handling of missing values, as subjects with many questions being left unanswered on their questionnaires were excluded, the subjects included in the analysis had only a few missing values and no missing values for the mediation and moderated-mediation analyses. Imputation methods were not used for the analysis.

This study was part of a larger study, which investigated stress, personality traits, affective symptoms, sleep, quality of life, well-being, resilience, etc., in adult volunteers by a questionnaire survey. In the original larger study, multivariable analysis of more than 30 independent variables was initially performed, and after consideration of missing data, 597 subjects were initially enrolled.[48,49] In our present study, subjects with a lot of missing data were excluded, and 585 of the subjects were analyzed. This is the reason for this sample size.

Results

Demographic Characteristics, and PHQ-9, PBI, Trait Anxiety of STAI-Y, and RRS Scores of the Subjects

Table 1 shows the results of the correlations and associations of demographic information and data from each questionnaire with depressive symptoms (PHQ-9 total scores) in the 585 subjects. Sex, marital status, and past history of psychiatric disease showed a significant association with PHQ-9 scores, but the other demographic characteristics

Table 1 Demographic Characteristics, Scores of STAI-Y, PBI, RRS, and PHQ-9, and Their Correlation with or Effects on PHQ-9 Scores

Characteristic or Measure	Value (% or Mean ± SD)	Correlation with PHQ-9 score (*r*) or Effect on PHQ-9 Score (mean ± SD of PHQ-9 score, *t*-test)
Age (Years)	41.7 ± 12.1	$r = -0.034$, $p = 0.406$
Sex (Male: Female)	42.6: 57.4	Male 3.5 ± 4.1 vs female 4.5 ± 4.3, $p = 0.006$ (*t*-test)
Education Years	14.6 ± 1.8	$r = -0.068$, $p = 0.100$
Marital Status (Married: Unmarried)	66.0: 34.0	Married 3.5 ± 3.9 vs unmarried 5.2 ± 4.7, $p < 0.001$ (*t*-test)
Past History Of Psychiatric Disease (Yes: No)	11.6: 88.4	Yes 6.7 ± 5.4 vs no 3.7 ± 3.9, $p < 0.001$ (*t*-test)
STAI-Y Score (Trait Anxiety)	42.9 ± 10.4	$r = 0.639$, $p < 0.001$

(*Continued*)

Table 1 (Continued).

Characteristic or Measure	Value (% or Mean ± SD)	Correlation with PHQ-9 score (*r*) or Effect on PHQ-9 Score (mean ± SD of PHQ-9 score, *t*-test)
PBI Father Care Score	23.5 ± 8.2	$r = -0.178$, $p < 0.001$
PBI Father Overprotection Score	9.7 ± 6.9	$r = 0.209$, $p < 0.001$
PBI Mother Care Score	28.0 ± 7.0	$r = -0.273$, $p < 0.001$
PBI Mother Overprotection Score	9.7 ± 7.0	$r = 0.240$, $p < 0.001$
RRS Total Score	35.2 ± 11.4	$r = 0.500$, $p < 0.001$
PHQ-9 Score	4.1 ± 4.2	

Notes: Data are presented as the percentage or mean ± SD, *r* = Pearson's correlation coefficient.
Abbreviations: SD, standard deviation; STAI-Y, State-Trait Anxiety Inventory form Y; PBI, Parental Bonding Instrument; RRS, Ruminative Responses Scale; PHQ-9, Patient Health Questionnaire-9.

Table 2 Mediation Effect of Depressive Rumination (RRS) on the Association Between Parenting (PBI) and Depressive Symptoms (PHQ-9) (Analysis by Model 4 of PROCESS)

PBI	PBI to RRS (a)	PBI to PHQ-9 (b)	RRS to PHQ-9 (c)	Mediation Effect of RRS (95% CI)	R^2
Father Care	–0.206***	–0.083*	0.474***	–0.098** (–0.142, –0.056)	0.260
Mother Care	–0.275***	–0.147**	0.457***	–0.126** (–0.175, –0.082)	0.277
Father OP	0.218***	0.112**	0.466***	0.101** (0.060, 0.146)	0.264
Mother OP	0.298***	0.097*	0.467***	0.139** (0.094, 0.189)	0.266

Notes: (a), (b), and (c) are shown in the model in Figure 1A. This analysis controlled for age and sex. Mediation effects indicate indirect effects of PBI on PHQ-9 via RRS. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. R^2 indicates the coefficients of determination.
Abbreviations: CI, confidence interval; OP, overprotection; PBI, Parental Bonding Instrument; PHQ-9, Patient Health Questionnaire-9; RRS, Ruminative Responses Scale.

Table 3 Moderated-Mediation Analysis: Mediating Effect of Depressive Rumination (RRS) on the Association Between Parenting (PBI) and Depressive Symptoms (PHQ-9), and Moderation by Trait Anxiety (STAI-Y) of the Effects of Parenting (PBI) and Depressive Rumination (RRS) on Depressive Symptoms (PHQ-9)

PBI	Effect of STAI-Y on PHQ-9	Moderation by STAI-Y on Effect of PBI on PHQ-9 (a)	Moderation by STAI-Y on Effect of RRS on PHQ-9 (b)	Index of Moderated Mediation (95% CI)	R^2
Father Care	0.199***	0.000	0.005***	–0.001* (–0.003, –0.001)	0.465***
Mother Care	0.204***	–0.008***	0.004***	–0.002* (–0.003, –0.001)	0.504***
Father OP	0.195***	0.001	0.005***	0.002* (0.001, 0.003)	0.468***
Mother OP	0.207***	0.001	0.005***	0.003* (0.001, 0.004)	0.483***

Notes: Figures 1B and 2A–D show this model. (a) and (b) are shown in Figure 1B. This analysis controlled for age and sex. Coefficients were not standardized. R^2 indicates the coefficients of determination. *$p < 0.05$; ***$p < 0.001$.
Abbreviations: CI, confidence interval; OP, overprotection; PBI, Parental Bonding Instrument; PHQ-9, Patient Health Questionnaire-9; RRS, Ruminative Responses Scale.

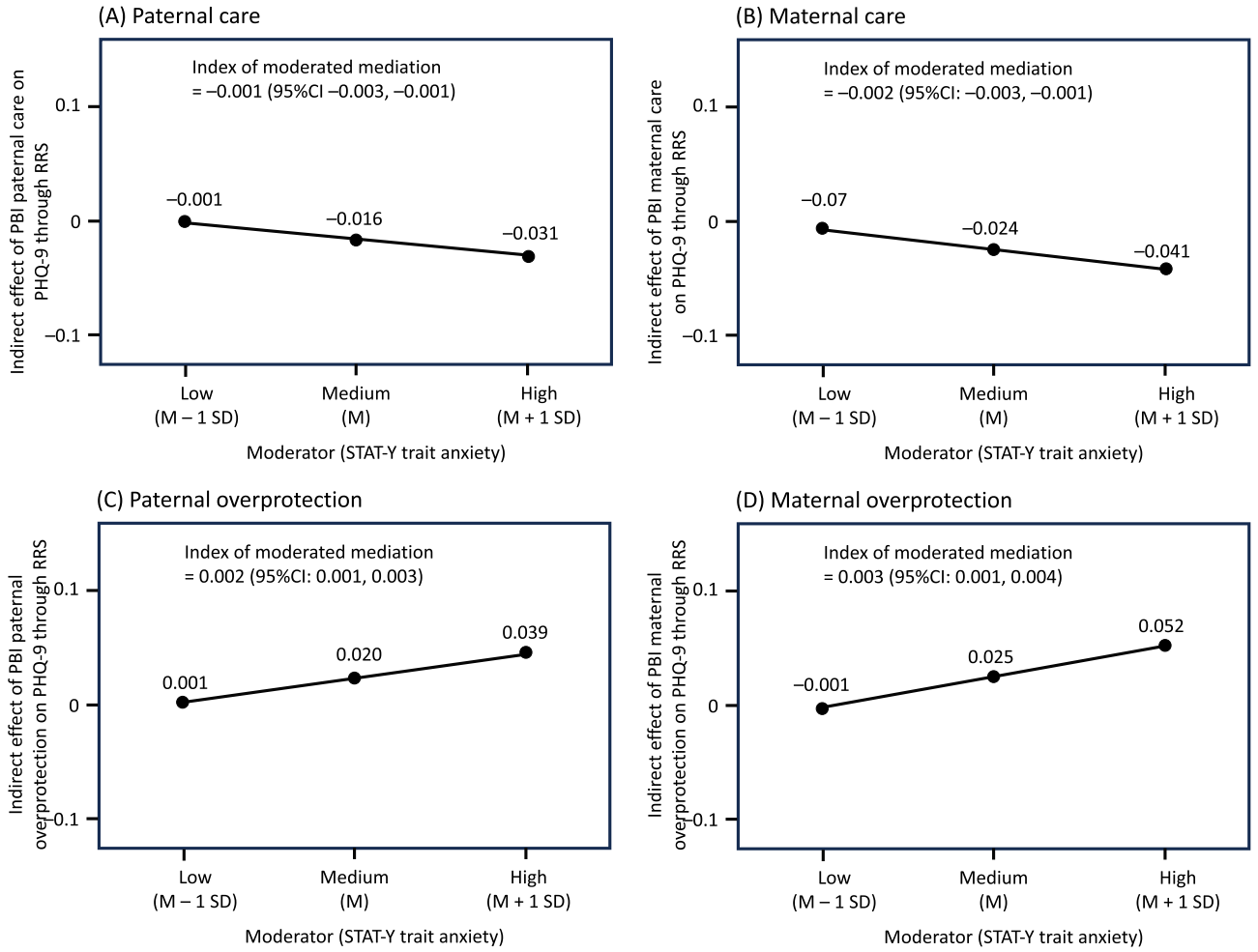

Figure 2 Effects of STAI-Y trait anxiety as a moderator on indirect effects of inappropriate nurturing experiences in childhood (PBI: (**A**) paternal care; (**B**), maternal care; (**C**) paternal overprotection; (**D**) maternal overprotection;) on depressive symptoms (PHQ-9) via depressive rumination (RRS) as a mediator in the moderated-mediation model (model 15).

Abbreviations: CI, confidence interval; PBI, Parental Bonding Instrument; PHQ-9, Patient Health Questionnaire-9; RRS, Ruminative Responses Scale; STAI-Y, State-Trait Anxiety Inventory form Y.

were not correlated with PHQ-9 scores. STAI-Y score (trait anxiety), maternal and paternal PBI overprotection scores, and RRS total score were positively correlated with PHQ-9 scores, and maternal and paternal PBI care scores were negatively correlated with PHQ-9 scores.

Direct Effects from Model 4 Mediation Analysis (Table 2)

Father's care and mother's care received in childhood showed a significantly negative effect on depressive rumination, whereas father's overprotection and mother's overprotection showed a significantly positive direct effect on depressive rumination. Father's care and mother's care in childhood showed a significantly negative direct effect on depressive symptoms in adulthood, whereas father's overprotection and mother's overprotection showed a significantly positive direct effect on depressive symptoms. Depressive rumination showed a significantly positive direct effect on depressive symptoms.

Indirect Effects from Model 4 Mediation Analysis (Table 2)

Father's care and mother's care in childhood had significantly negative indirect effects on depressive symptoms via their effects on depressive rumination. Father's overprotection and mother's overprotection during childhood had significantly positive indirect effects on depressive symptoms via their effects on depressive rumination. That is, care and over-protection by parents during childhood were associated with a reduction and exacerbation of depressive symptoms,

respectively, in adulthood via their effects on depressive rumination. The overall effect of inappropriate parental nurturing on depressive symptoms was partially mediated by depressive rumination, with a mediating effect of 46% to 59%.

Moderated-Mediation Analysis Using Model 15 (Table 3)

Trait anxiety moderated (increased) the effect of depressive rumination on depressive symptoms. Trait anxiety moderated (attenuated) only the effect of the mother's care on depressive symptoms among the inappropriate nurturing experiences, but did not significantly moderate the effects of the mother's overprotection and the father's care and overprotection on depressive symptoms. The moderated-mediation effect indices for the effects of parental overprotection and care on depressive symptoms through depressive rumination (RRS) in this model were all significant (Table 3, Figure 2A–D). That is, when trait anxiety was high, the mediation effect of depressive rumination on parental care and depressive symptoms was decreased, and the mediation effect of depressive rumination on parental overprotection and depressive symptoms was enhanced (Figure 2A–D).

Discussion

The present study was conducted using moderated-mediation analysis to test the hypothesis that the effects of inappropriate childhood nurturing experiences on depressive symptoms were mediated by depressive rumination, and that the mediating effects of depressive rumination were moderated by trait anxiety. The results showed that depressive rumination partially mediates the effect of inappropriate childhood nurturing experiences on depressive symptoms in adulthood, and that high trait anxiety interacts with depressive rumination and maternal care to worsen depressive symptoms. Furthermore, trait anxiety was found to moderate the mediation effects of depressive rumination. To the best of our knowledge, this is the first report to date of such findings. In summary, regarding the association of the 3 factors of inappropriate nurturing experience, depressive rumination, and depression, depressive rumination demonstrated a mediating effect, whereas trait anxiety demonstrated a moderating effect.

As described in the Introduction section, depressive rumination is involved in the development of depression.[25–30] Consistent with these previous studies, depressive rumination moderately correlated with depressive symptoms in the present study. What is new in this study is the finding that the effects of the 4 different inappropriate nurturing factors, care and overprotection by the father or mother, on depressive symptoms were statistically significant, and depressive rumination mediated all 4 types of associations. A previous long-term prospective study reported that the effects of positive nurturing by mothers in childhood on depression in adolescent girls were mediated by depressive rumination.[33] However, this previous study by Gaté et al did not analyze the mediating effect of depressive rumination on paternal nurturing, and furthermore, the mediating effect of depressive rumination on maternal aggressive nurturing was not statistically significant.[33] Thus, in the present study we confirmed the mediating effect of depressive rumination found by Gaté et al, by extending it to paternal nurturing and negative nurturing.[33] Similar to childhood inappropriate nurturing experiences, the mediating effect of depressive rumination on the effects of childhood abuse and peer victimization experiences on depression has been reported previously, suggesting that it can be generalized that various childhood stress experiences, not limited to inappropriate nurturing experiences, indirectly enhance depressive symptoms in adults by exacerbating depressive rumination.[9,32]

In the present study, the effect of the interaction between depressive rumination and trait anxiety on depressive symptoms was significantly positive. This means that depressive rumination worsens depressive symptoms in individuals with high trait anxiety. Thus, when individuals have high levels of both trait anxiety and depressive rumination, interventions that decrease both are expected to synergistically improve depressive symptoms. Both trait anxiety and depressive rumination are risk factors for the onset or exacerbation of depressive symptoms.[9,15,25–30,32,38,39] A chain reaction mediating effect was reported in which trait anxiety enhances depressive rumination, which further enhances depressive symptoms.[9,32] In addition, as we showed in the present study, trait anxiety and depressive rumination interact to enhance depressive symptoms, suggesting that they have a mutually complex association for enhancing depression. In other words, because trait anxiety and depressive rumination form a vicious cycle or a negative spiral against depressive symptoms, interventions to decrease both are expected to be effective in clinical practice.

It is unclear why only the mother's care had a moderating effect together with trait anxiety on depressive symptoms, whereas all 4 nurturing factors, paternal or maternal care and overprotection, had significant effects on depressive

symptoms in adulthood. In our recent study, among parental care and overprotection, maternal care in particular significantly affected hopeful thinking in adults, and reduced depressive symptoms through its effect on hopeful thinking.[50] Positive parental nurturing is considered to be a resilience factor for children,[51] and hopeful thinking is also considered to be a resilience-enhancing factor.[52,53] Similarly, some reports indicated the importance of maternal factors, particularly in influencing children's personality development, resilience, and interpersonal sensitivity during adolescence.[17,54,55] Thus, among the various parental nurturing factors, maternal care strongly influences some psychological mechanisms, which may explain why trait anxiety only interacted with maternal care in the present study.

Previous neuroimaging studies have shown that depressive rumination is associated with activation and connectivity within the amygdala, medial prefrontal cortex, and posterior cingulate cortex.[29] These brain regions include the default mode network, which is typically activated during resting states, when an individual is focused internally rather than on external tasks or environmental stimuli.[29] Individuals who have trait rumination show increased activity within the default mode network. On the other hand, trait anxiety is also closely associated with these brain regions.[38,56] The above neural mechanisms may account for the relevance of depressive rumination and trait anxiety to depression, because depression was associated with these regions, including the default mode network.[57–59]

The results of the present study indicate that depressive symptoms are exacerbated in the context of childhood experiences of inappropriate nurturing, which enhance depressive symptoms by intensifying depressive rumination, and that depressive rumination and trait anxiety mutually reinforce each other and enhance depressive symptoms. These results provide clinically useful suggestions. Preventing low care and overprotection in childhood is expected to prevent depressive symptoms, but it is not easy for parents or third parties to intervene preventively in inappropriate parental nurturing. However, even if a person has experienced low care and overprotection, if depressive rumination as a mediating factor and trait anxiety as a moderating factor are recognized through careful clinical assessment as in this study, interventions for these factors can reduce depressive symptoms and prevent the onset or exacerbation of depression. Interventions for depressive rumination are considered clinically important in terms of reducing depressive symptoms, and cognitive-behavioral therapies focused on depressive rumination have recently been developed.[29] Mindfulness-based cognitive therapy was shown to be effective in lowering depressive rumination.[30] In addition, selective serotonin reuptake inhibitors, the transcendental meditation technique, and exercise therapy have been reported to attenuate trait anxiety.[60–62] Future development of evaluations that encompass a variety of factors, similar to the Habit development, Executive control, Abstract processing, Goal discrepancies, Negative bias (H-EX-A-GO-N) model is needed.[29] The results obtained in the present study indicate that elucidating the mechanisms of the association among experiences of inappropriate nurturing in childhood, trait anxiety, and depressive rumination may contribute to the development of interventions for depression. Furthermore, future studies are necessary to investigate the efficacy of interventions for these factors in clinical settings.

Limitations

Because this study relied on the memories of the subjects and used a self-report questionnaire, memory bias may have confounded the results. However, the validity of the retrospective evaluation by the PBI used in the present study has been confirmed in previous studies.[41] Adverse childhood experiences (ACEs) have been reported to affect mental and physical health in adulthood.[63] Numerous retrospective studies on ACEs have been conducted around the world, and a prospective study using the Dunedin cohort confirmed the validity of the retrospective assessment of ACEs.[64] Therefore, we did not consider memory bias to be a serious problem in the present study. Additionally, as the study was conducted on general adult volunteers, the present findings may not apply to patients with depression. There are cultural differences in parenting styles,[65] and these differences might influence the effects of parenting on depressive symptoms. As this study was conducted in Japan, cultural differences may influence the generalizability of our findings to other populations. Therefore, replicating the study in different cultural and geographic contexts would enhance the generalizability of the findings. As the design of the present study is cross-sectional, a prospective study, which can be retested for example in 1 year, is necessary for concluding a causal association. In the present study, we hypothesized that trait anxiety, which is a type of personality trait that causes anxiety, influences rumination. However, a prospective verification study is needed in the future, as higher rumination may result in higher trait anxiety. In addition to the inappropriate nurturing experiences analyzed in the present study, other environmental factors, including abuse and

bullying victimization in childhood and harassment experienced in adulthood may influence trait anxiety and depressive rumination. Therefore, a more comprehensive analysis including these multiple factors is needed in the future.

Conclusions

The present study is the first report to our knowledge that depressive rumination mediates the effects of inappropriate nurturing experiences in childhood on depressive symptoms, and that these mediating effects are moderated by trait anxiety. The interrelationships among inappropriate childhood nurturing experiences, trait anxiety, depressive rumination, and depressive symptoms were demonstrated in a moderated-mediation model. In the future, based on the results of this study, a large-scale prospective study of community residents is needed to confirm a causal association.

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Author Contributions

All authors made a significant contribution to the work reported, whether in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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