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Parental rearing attitudes in childhood is associated with adult sleep disturbances independently from depression and life events: a cross-sectional survey in Japan

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ABSTRACT

　　Sleep disturbance associated with depression and suicide is a serious public health concern. Previous studies have suggested that sleep disturbances increase the risk of suicide without going through depression. Adverse childhood experience, which has a long-term effect on mental health, is also a serious problem. We conducted a study to investigate the association between parental rearing attitudes in childhood and sleep disturbances in adulthood by performing a questionnaire survey. A cross-sectional survey performed with the residents of a provincial city in Japan. A total of 1,500 male (aged $\geq$ 30 years) subjects were randomly selected by a computer from the basic resident register after stratifying them by age. The subjects were assessed by personal characteristics, the Center for Epidemiologic Studies Depression Scale (CES-D), the Social Readjustment Rating Scale (SRRS), and the Parent Bonding Instrument (PBI). We obtained an answer from 400 people (26.7%) among 1,500 subjects. Their average age and standard deviation were 48.3±8.6 years at the time of the survey. According to performing a logistic regression analysis that assessed each parental bonding type compared with optimal bonding adjusted for CES-D and SRRS, "affectionless control" and "awaking during sleep," and "affectionate constraint" and "a sense of insufficiency of the sleep" were significantly associated, even after controlling for age (OR 2.93, 95% CI: 1.46-5.87; OR 0.24, 95% CI: 0.07-0.79, respectively). Our study raises the possibility that the parental care of a child affects sleep disturbances in adulthood.

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Key words: Men's health, Sleep disturbances, Parental rearing attitude, Depression, Life events

1. Introduction

　　Adverse childhood experiences (ACEs), including child abuse, neglect, parental separation, and divorce, have been focused on as risk factors for mental health disorders. According to previous reports, ACEs increase the risk of depression and suicide in adulthood[1-4], indicating that ACEs have a long-term effect on mental health. In recent years, there are studies that quantitatively evaluate parental rearing attitudes and their influence on mental health. In studies using Parental Bonding Instrument (PBI) developed by Burbach DJ et al. (1989)[5], parental rearing that lacked interest and affection was associated with various mental health problems including depression, eating disorders, and suicide, regardless of the time from exposure to onset[6-11]. From the above, even if the problems of parent-child relationship in early childhood are not seriously crucial (such as obvious child abuse), it may affect long-term mental health conditions in adulthood. Regarding psychiatric or biological mechanism, a previous report indicated that young women exposed to ACEs have a higher risk of depression, even with a mild stress, suggesting that ACEs weaken stress tolerance[12]. In addition, those who have a history of child abuse have increased adrenocorticotropic hormone (ACTH), cortisol

concentration and heart rate with psychosocial stress, and decreased self-esteem[13].

Meanwhile, sleep disturbance is a serious public health concern which is considered not only a problem itself but also as a cause of subsequent more serious mental health problems[14]. In Japan, according to the Ministry of Health, Labor and Welfare's National health and Nutrition Poll in 2013 (N = 3,311), 67% of subjects had sleep problems, including disturbance of sleep induction, early morning awakening, waking during sleep, and insufficiency of sleep[15]. In previous studies, sleep disturbance was associated with current or future serious mental health problems, such as depression and suicide[14-21]. According to the investigation in Jones-Hopkins University that spanned over approximately forty years, the presence of past sleep disturbance is a risk of depression in adulthood[22], suggesting a long-term effect of sleep disturbance on mental health. Thus, sleep disturbance is not only a symptom in mental health disorders, but rather can be a factor causing a new mental health problem.

Based on the above, both ACEs and sleep disturbance have long-term influence on mental health, but there are few reports discussing these relationships thus far. We, therefore, conducted a study to investigate the association between parental rearing attitudes in childhood and sleep disturbance in adulthood by performing a questionnaire survey, including PBI. As the suicide rate of Japanese men in the prime of life has remained high (around 30.0 per 100,000) particularly after 1998[23], mental health problems of this population in Japan are serious. Therefore, this population was set for the target population in this study. The eventual goal of our study was to identify the high-risk population from the view point of parent-child relationship in early childhood, and developing an efficient precautionary approach of sleep disturbance in adulthood.

2. Methods

2.1. Study design and subjects

This study is a cross-sectional survey, and was performed among the residents of Otaru, a northern city in Japan, in October and December 2013.

In 2013, the registered population of the entire city was approximately 127,000 (men = 57,662). From the basic resident register, a total of 1,500 male (aged ≧ 30 years) subjects were randomly selected by a computer after stratifying them by age. A structured questionnaire, including a letter, which explained the purpose of the survey and contained a request to participate, was mailed to each of the selected subjects at the end of October 2013. Submission of the completed form was requested back by the end of December 2013.

2.2. Measurements

The questionnaire included personal characteristics and psychological measurements.

2.2.1. General characteristics

Personal characteristics included the following items: age, marital status, education level, employment status, BMI, sleeping habits, physical exercise habits, and smoking status. Body Mass Index (BMI) was calculated from the question on current weight (measured in kg) and height (measured in cm). This was divided into four categories (<18.5, 18.5 - 24.9, and >25.0).

2.2.2. Sleeping habits

A questionnaire for sleeping habits was made by modifying the questionnaire used in the previous study[24]. The questions included eight items: daily hours of sleep (defined by an answer fewer than 6 h), difficulty initiating sleep (defined by taking more than 30 min to fall asleep), mid-sleep waking (defined by an answer of more than three times a week), early-morning waking (defined by an answer more than three times a week), difficulty waking up in the morning (defined by considerably/somewhat), sleeping poorly at night (defined by very poorly/not so well), insufficiency of sleep (definitely/somewhat), and difficulty breathing during sleep (defined by more than once a week). Sleeping poorly at night was defined as getting enough sleep despite having sleepiness and malaise. Insufficiency of sleep was measured as a subjective level of satisfaction.

2.2.3. Psychological measurements

Psychological conditions were quantitatively evaluated by the Center for Epidemiologic Studies Depression Scale (CES-D)[25], the Social Readjustment Rating Scale (SRRS)[26], and the Parent Bonding Instrument (PBI)[27, 28].

The CES-D scale was used in assessing the depressive symptom. The CES-D scale in the Japanese version was taken from the National Institute for Occupational Safety and Health. This scale has 20 items that measured the level of depressive symptoms experienced in the past week. CES-D was divided into

two classes using a score of 16.0 as a cut-off point for severity. These two groups were high-level depressive symptoms (more than 16) and lower levels of depression (less than 15).

The Social Readjustment Rating Scale (SRRS) was used to identify major stressful life events using a self-report questionnaire developed by Holmes and Rahe in 1968. SRRS measured the strength of stress that the responder had passed through a variety of life events in this 43 -item scale, which have occurred to subjects within certain periods of one year. All items were scored on a zero to four scale with zero representing "no event," one "not upset/distressed," two "a little upset/ distressed," three "moderately upset/distressed," and four "very distressed." A total score of 150 or less was good, suggesting a low level of stress in one year and a low probability of developing a stress-related disorder. A score of 150 or more statistically experienced strong stress levels and stood an almost 50-80% chance of getting a psychosomatic disorder in the near future.

2.2.4. Parental bonding instrument（PBI）

PBI is a widely used self-reporting questionnaire to evaluate parental child-rearing behavior. This questionnaire has 25 items rated on a four-point Likert-Type scale. This scale consists of 12 items assessing "care" and 13 items assessing "protection." The care dimension ranges from affection, closeness, and reciprocity to rejection, coldness, and indifference, including items such as "Spoke to me in a warm and friendly voice." Protection dimension ranges from overprotection, extensive intrusion, control, and infantilization, to the promotion of independence and autonomy, including items such as "Liked me to make my own decisions." These items were used to divide four major dimensions of parental bonding, such as "optimal bonding" (high care and low protection), "abuse or weak bonding" (low care and low protection), "affectionate constraint" (high care and high protection), and "affectionless control" (low care and high protection). High care was determined if 24 points for paternal and 27 points for maternal points or more in the care score (these are separately determined). High protection was determined if 12.5 points for paternal and 13.5 points for maternal points or more in the protection score.

2.3. Statistical analyses

All analyses were performed using SPSS ver.22.0.

$P < 0.05$ was considered statistically significant. Statistical analyses, in detail, were as follows.

2.3.1. Categorical analyses

To distinguish unhealthy sleeping habits, all items related to sleep were binarized. Using this binarized outcome, we carried out descriptive analysis and logistic regression. The prevalence of sleeping habits by different categories was shown along with P values of their bivariate association obtained by a chi-square test and residual analysis. In the residual analysis, standardized adjusted residuals were calculated for each cell in cross-tabulation Tables and are considered statistically significant when they were greater than 1.96 (see https://www.ibm.com/support/ knowledgecenter/en/SSLVMB_23.0.0/spss/base/idh_ xtab_cell.html). Logistic regression analysis was performed to assess the association between PBI (four categories) and sleeping habits (binarized) with the adjustment for age, CES-D, and SRRS (as continuous variables).

2.3.2. Path analysis

Path analysis was performed using multiple linear regression model for visualization of direct/ indirect effect of parental bonding[29]. In the analysis, all of outcomes and explanatory variables were input as continuous variables (including standardized CES-D, SRRS and PBI), and coefficients calculated in the model was interpreted as path coefficient. Variables for parental bonding were raw scores for care and protection (described above).

3. Ethics

The Ethics Committee at Sapporo Medical University School of Medicine approved this study.

4. Results

4.1. Baseline characteristics

We obtained answers from 400 people (26.7%) among the 1,500 subjects who participated in the study and mailed back the completed questionnaire before the deadline. The data of 400 people was analyzed. The average age at the time of the survey was higher for those who were over 50 (49.5%) compared with subjects in their 30s (20.3%). This ranged from 31 to 63 (mean 48.3, SD 8.6), which is shown in Table 1. Among them, 132 (33.0%) subjects had depressive symptoms and subjects of SRRS with a score of 150 or more

Table 1. Descriptive Statistics of Baseline Charactaristics in Study

Variable	Sample size(%)	Mean (SD, range)
Number	400	
Age group (year)		48.3 (8.6, 31 - 63)
・30 - 39	81 (20.3)	
・40 - 49	121 (30.3)	
・50 - 59	168 (42.0)	
・60+	30 (7.5)	
Marital status		
・Currently married	297 (74.3)	
・Not married	82 (20.5)	
・Divorced	18 (4.5)	
・Widowed	3 (0.8)	
Education group (year)		
・6 - 9	19 (4.8)	
・10 - 12	187 (46.8)	
・13 - 16	182 (45.5)	
・16+	12 (3.0)	
Employment status		
・Regular occupation	279 (69.8)	
・Self-employed	48 (12.0)	
・Atypical employment	36 (9.0)	
・Unemployment	27 (6.8)	
・other	10 (2.5)	

Table 2. Descriptive statistics of life habits and scale score (CES-D, SRRS and PBI).

Variable	Sample size(%)	Mean (SD, range)
number	400	
BMI:		
・<18.5	8 (2.0)	
・18.5 - 24.9	238 (59.5)	
・≧25.0	153 (38.3)	
Physical exercise habits (vs yes)	143 (35.8)	
Smoking:		
・Non-smoker	77 (19.3)	
・Every day	167 (42.0)	
・Occasional smorker	8 (2.0)	
・EX-smoker	146 (36.7)	
Drinking		
・Non-drinking	78 (19.5)	
・Every day	152 (38.0)	
・Occasional drinker	157 (39.3)	
・EX-drinking	13 (3.3)	
Sleeping habits:		
・Daily sleep duration: fewer than 6h and more than 10h	169 (42.3)	
・Taking more than 30 min to fall asleep	70 (17.5)	
・Waking during sleep more than 3 times/week	173 (43.3)	
・Early morning awakening more than 3 times/week	52 (13.0)	
・Difficulty waking up in the morning (Considerably/somewhat)	287 (71.8)	
・A sense of insufficiency of sleep (definitely/somewhat)	194 (48.5)	
・Sleeping poorly at night (very poorly/not so well)	175 (43.8)	
・Difficulty breathing during sleep (more than once a week)	39 (9.8)	
CES-D score:		13.2 (8.8, 0 - 55)
・<16.0	267 (66.8)	
・≧16 (Depressive symptom)	132 (33.0)	
SRRS score:		90.6 (79.8, 0 - 466)
・<150	320 (80.8)	
・≧150 (sick near future)	76 (19.2)	
Father bonding types:		
・Optimal bonding	140 (44.0)	
・Affectionless control	57 (17.9)	
・Affectionate constraint	17 (5.3)	
・Abuse or weak bonding	104 (32.7)	
Mother bonding types:		
・Optimal bonding	190 (57.4)	
・Affectionless control	61 (18.4)	
・Affectionate constraint	34 (10.3)	
・Abuse or weak bonding	46 (13.9)	

were 76 (19.2%). They were divided into four groups of parental bonding types. In these groups, "paternal optimal bonding" (57.4%) was the largest number in comparison to "paternal affectionless control" (18.4%), "paternal abuse or weak bonding" (13.9%), and "paternal affectionate constraint" (10.3%). "Maternal optimal bonding" (57.4%) was the largest number in comparison to "maternal affectionless control" (18.4%), "maternal abuse or weak bonding" (13.9%), and "maternal affectionate constraint" (10.3%). The overall prevalence of having difficulty waking up in the morning (71.8%) was the most frequently reported self-reported sleeping habit in this study. Other self-reported sleeping habits were "a sense of insufficiency of sleep" (48.5%), "sleeping poorly at night" (43.8%), "waking during sleep more than three times per week" (43.3%), and "daily sleep duration fewer than six h and more than ten h" (42.3%) in Table 2.

4.2. Parental bonding types by sleep disturbances, CES-D and SRRS

As shown in Table 3, the residual analysis demonstrated that the father and mother bonding types were significantly associated with sleeping habits, CES-D, and SRRS. "Paternal affectionless control" was positively correlated with "waking during sleep more than three times per week" (p = 0.002), "early morning awakening more than three times per week" (p = 0.003), "a sense of sufficiency of sleep" (p = 0.019),

Table 3. Parental and maternal bonding types by sleeping habits, CES-D, and SRRS

		Paternal bonding types[a]					Maternal bonding types[a]				
		Optimal Bonding	Affectionless Control	Affectionate Constraint	Abuse or Weak Bonding	p value	Optimal Bonding	Affectionless Control	Affectionate Constraint	Abuse or Weak Bonding	p value
Daily sleep duration	6–9h	86　61.4%	29　50.9%	11　64.7%	62　59.6%		115　60.5%	28　45.9%	22　64.7%	27　58.7%	
	<6h or 10+h[b]	54　38.6%	28　49.1%	6　35.3%	42　40.4%	0.544	75　39.5%	33　54.1%	12　35.3%	19　41.3%	0.187
Taking more than 30 min to fall asleep	less than 30 min	123[#]　88.5%	45　80.4%	11　64.7%	81　78.6%		156　82.5%	47　77.0%	27　79.4%	38　84.4%	
	more than 30 min	16　11.5%	11　19.6%	6[#]　35.3%	22　21.4%	0.038	33　17.5%	14　23.0%	7　20.6%	7　15.6%	0.731
Waking during sleep (times/week)	less than 3 times	91[#]　65.0%	21　37.5%	13　76.5%	57　54.8%		119　63.0%	30　50.0%	16　47.1%	22　47.8%	
	more than 3 times	49　35.0%	35[#]　62.5%	4　23.5%	47　45.2%	0.002	70　37.0%	30　50.0%	18　52.9%	24　52.2%	0.076
Early morning awakening (times/week)	less than 3 times	123　87.9%	41　73.2%	16　100.0%	95　91.3%		167　88.4%	50　83.3%	28　82.4%	38　82.6%	
	more than 3 times	17　12.1%	15[#]　26.8%	0　0.0%	9　8.7%	0.003	22　11.6%	10　16.7%	6　17.6%	8　17.4%	0.563
Difficulty waking up in the morning	no	102　72.9%	44　78.6%	10　58.8%	74　71.2%		131　68.9%	42　70.0%	25　73.5%	36　78.3%	
	yes	38　27.1%	12　21.4%	7　41.2%	30　28.8%	0.434	59　31.1%	18　30.0%	9　26.5%	10　21.7%	0.638
Difficulty breathing during sleep	no	129　92.1%	50　87.7%	16　94.1%	94　90.4%		177　93.2%	50　82.0%	31　91.2%	40　87.0%	
	yes	11　7.9%	7　12.3%	1　5.9%	10　9.6%	0.752	13　6.8%	11　18.0%	3　8.8%	6　13.0%	0.071
A sense of insufficiency of the sleep	sufficiency	76　54.3%	19　33.9%	12　70.6%	55　52.9%		104　54.7%	22　36.7%	18　52.9%	24　52.2%	
	insufficiency	64　45.7%	37[#]　66.1%	5　29.4%	49　47.1%	0.019	86　45.3%	38　63.3%	16　47.1%	22　47.8%	0.108
Sleeping poorly at night	well	84　60.0%	23　41.1%	12　70.6%	61　59.2%		116　61.1%	26　43.3%	18　52.9%	26　56.5%	
	poorly	56　40.0%	33[#]　58.9%	5　29.4%	42　40.8%	0.050	74　38.9%	34　56.7%	16　47.1%	20　43.5%	0.111
CES‐Dc	<16.0	118[#]　84.3%	26　45.6%	7　41.2%	71　68.9%		141[#]　74.6%	25　41.0%	19　55.9%	35　76.1%	
	≧16.0	22　15.7%	31[#]　54.4%	10[#]　58.8%	32　31.1%	<0.001	48　25.4%	36[#]　59.0%	15　44.1%	11　23.9%	<0.001
SRRSd	<150	126[#]　90.0%	38　66.7%	13　76.5%	80　79.2%		160[#]　85.6%	41　67.2%	27　79.4%	36　78.3%	
	≧150	14　10.0%	19[#]　33.3%	4　23.5%	21　20.8%	0.001	27　14.4%	20[#]　32.8%	7　20.6%	10　21.7%	0.018

[a] Four dimensions of parental bonding types are divided using parental bonding instrument. Optimal bonding: high care-high control /Abuse or weak bonding: low care-low control /Affectionless control: low care-high control /affectionate constraint: high care-high control /Affectionate control: low care-low control.

[b] Daily sleep duration fewer than 6 hours is sleep deprived and more than 10 hours is hypersomnia.

[c] CES-D: A score of more than 16 is the high level depressive symptom.

[d] SRRS: A score of 150 or more has strong stress, and there is pssibility of getting a psychosomatic disorder in the near future.

"sleeping poorly at night" (p = 0.05), "CES-D" (p < 0.001), and "SRRS" (p = 0.001). The paternal affectionate constraint was "positively correlated with taking more than 30 min to fall asleep more than three times per week" (p = 0.038), and "CES-D" (p < 0.001). Likewise, "maternal affectionless control" was also positively associated with CES-D (p < 0.001) and SRRS (p < 0.018). On the other hand, paternal optimal bonding shows the negatively associations with "taking more than 30 min to fall asleep" (p = 0.038), "waking during sleep" (p = 0.002), "a sense of sufficiency of sleep" (p = 0.019), "sleeping poorly at night" (p = 0.05), "CES-D" (p < 0.001), and "SRRS" (p = 0.001). This bonding type was also associated with "CES-D" (p < 0.001) and "SRRS" (p = 0.001) in maternal ones.

4.3. Sleep disturbances by CES-D and SRRS

We investigated whether among these factors (sleep disturbances, CES-D, and SRRS) have relevance. As shown in Table 4, a chi-square test demonstrated that sleeping habits were significantly associated with CES-D and SRRS. SRRS was positively associated with "daily sleep duration" (p = 0.003), "taking more than 30 min to fall asleep" (p = 0.001), "difficulty breathing during sleep" (p = 0.042), and "a sense of insufficiency of the sleep" (p = 0.011). CES-D was associated with all the other sleeping habits other than "waking during sleep" and "early morning waking".

4.4. Sleep disturbances and parental bonding types, controlling for confounding factors

From the above results, the association between parental bonding and sleep disturbances was observed. However, these results can be influenced by recall biases based on confounding from current depression condition and recent life events. We then performed a logistic regression analysis to explore the association between independent variables to control the recall bias and assess direct effect of parental bonding to sleep disturbances. According to the model in Table 5 that assessed each parental bonding type compared with optimal bonding adjusted for age, CES-D and SRRS, "affectionless control and awaking during sleep" and "affectionate constraint and a sense of insufficiency of the sleep" were significantly associated (OR: 2.93, 95% CI: 1.46-5.87, OR: 0.24, 95% CI: 0.07-0.79, respectively).

4.5. Path analysis

To visualize the direct/indirect effect of paternal parental bonding on sleep disturbances, we performed path analysis as summarized in Figure 1. A path diagram was constructed based on previous results in this study and publications cited in the introduction. As shown in Figure 1A, the "care" score is associated independently from depression with awaking during sleep. Next, since a statistical interaction was suggested between "care" and "protection" to the outcome in multiple linear regression analysis with interaction term

Table 4. Sleep Disturbances by SRRS and CES-D

		SRRS[a]				CES-D[b]			
		<150		≧150	p value	<16		≧16	p value
Daily sleep duration	6 - 9h	197	86.0%	32	14.0%		167	72.3%	100	59.5%	
	<6 or 10+	123	73.7%	44	26.3%	0.003	64	27.7%	68	40.5%	0.010
Taking more than 30 min to fall asleep	less than 30 min	273	84.3%	51	15.7%		233	71.3%	94	28.7%	
	more than 30 min	45	65.2%	24	34.8%	0.001	31	44.9%	38	55.1%	<0.001
Waking during sleep (times/week)	less than 3 times	187	83.9%	36	16.1%		158	70.2%	67	29.8%	
	more than 3 times	131	76.6%	40	23.4%	0.073	108	62.8%	64	37.2%	0.132
Early morning awaking (times/week)	less than 3 times	280	81.9%	62	18.1%		237	68.7%	108	31.3%	
	more than 3 times	38	73.1%	14	26.9%	0.135	30	57.7%	22	42.3%	0.153
Difficulty waking up in the morning	no	232	81.1%	54	18.9%		208	72.5%	79	27.5%	
	yes	87	79.8%	22	20.2%	0.778	59	53.2%	52	46.8%	<0.001
Difficulty breathing during sleep	no	296	82.2%	64	17.8%		252	69.8%	109	30.2%	
	yes	24	66.7%	12	33.3%	0.042	15	39.5%	23	60.5%	<0.001
A sense of insufficiency of the sleep	sufficiency	174	85.7%	29	14.3%		159	77.9%	45	22.1%	
	insufficiency	145	75.5%	47	24.5%	0.011	108	55.7%	86	44.3%	<0.001
Sleeping poorly at night	well	186	84.2%	35	15.8%		171	77.0%	51	23.0%	
	poorly	132	76.3%	41	23.7%	0.054	95	54.3%	80	45.7%	<0.001

[a] SRRS: A score of 150 or more has strong stress, and there is the possibility of getting a psychosomatic disorder in the near future.
[b] CES-D: A score of more than 16 was the high level depressive symptom.

X_{1care} : Care score in PBI (paternal)
X_{1protect.} : Protection score in PBI (paternal)
p_{ab}: Path coefficient between X_a and X_b calculated by multiple linear regression model (numbers appearing beside the arrows)
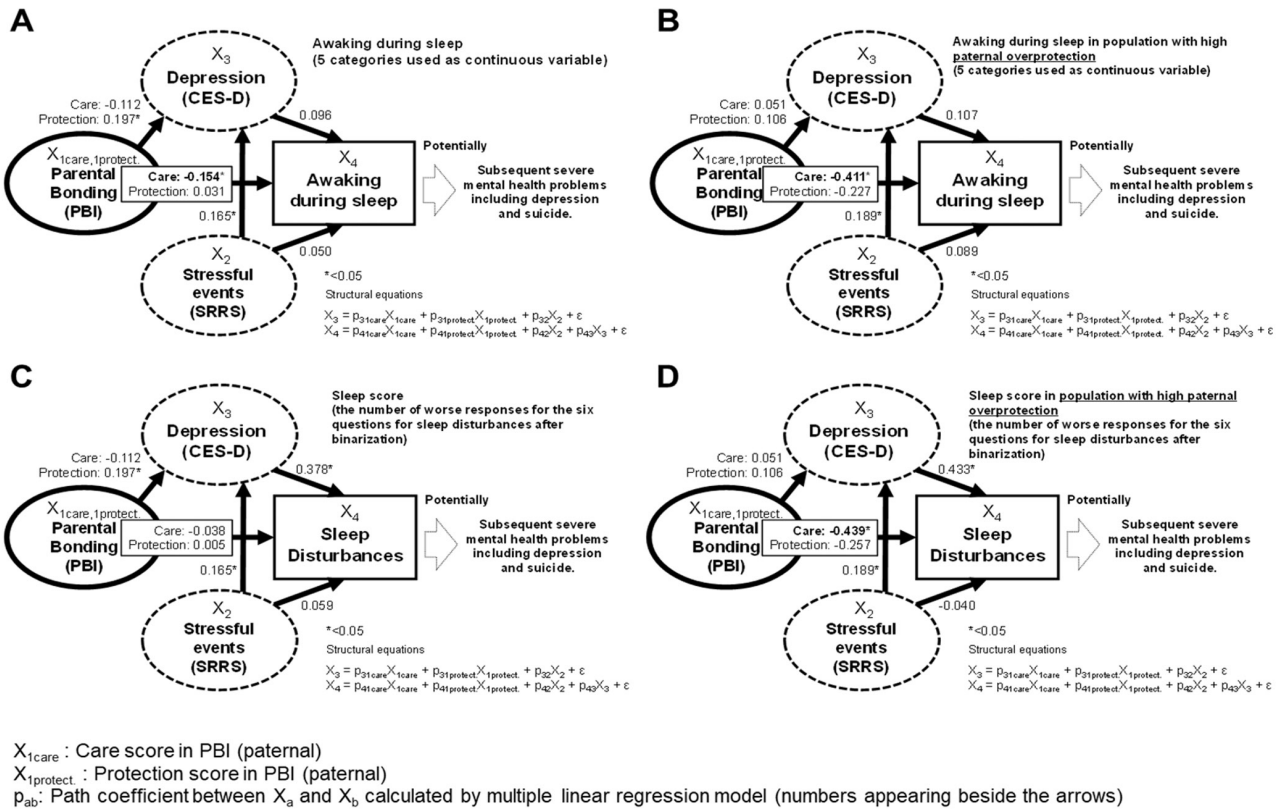
Figure 1. The direct/indirect effect of paternal parental bonding on sleep disturbances.

(data not shown), we performed subgroup analysis stratified by the protection score (high or low). In this analysis, the care score is more strongly associated with the outcome (Figure 1B). It suggested that care was more important for overprotected population, which is corresponding to population with affection less control (low care) or affectionate constraint (high care). Subsequently, to assess general sleep condition, we calculated the "sleep score" as counting the number of worse responses after binarization in the eight questions (as in Table 3, the maximum score is 8). When the outcome was the "sleep score", we found almost no direct association between paternal parental bonding and sleep disturbances, being consistent to the result in Table 5 except "waking during sleep" (Figure 1C). However, if we restricted analysis subjects to the population with overprotected population, the "care" was highly associated with sleep disturbances directly (Figure 1D). The result suggested that overprotection without affection (care) has harmful influence on sleep condition independently from depression.

5. Discussion

The key analysis in this study is an assessment of the association between parental bonding in childhood and sleep disturbances in adulthood (summarized in Table 5 and Figure 1). In the results referred to the paternal bonding types (Table 5), the association between "affectionless control (low care, high protection) and waking during sleep (risk elevation)" and "affectionate constraint (high care, high protection) and a sense of insufficiency of the sleep (risk reduction)" were significant, even after controlling for age, CES-D score, and SRRS score. In contrast, the maternal bonding type did not remain significant after controlling for these confounders. This result is consistent with the previous report that receiving low care of parental bonding from the same sex impaired the quality of sleep[30]. The impact of "affectionless control" on the future has been clarified in many past studies. For example, it is associated with adult depression[10], prolongation the duration of achieving remission of depression[7] and suicide in adulthood[9]. Taken together with this study, "affectionless control

Table 5. Sleep Disturbances and Parental Bonding Types. Logistic Regression Models (odds ratios with 95% confidence interval) with Additional Adjustments for Age, CES-D and SRRS.

Paternal bonding types

Outcomes: sleeping habits (reference: optimal bonding)	Crude — Optimal Bonding OR	Crude — Affectionless Control OR	95% CI lower	upper	Crude — Affectionate Constraint OR	95% CI lower	upper	Crude — Abuse or Weak Bonding OR	95% CI lower	upper	Adjusted — Optimal Bonding OR	Adjusted — Affectionless Control OR	95% CI lower	upper	Adjusted — Affectionate Constraint OR	95% CI lower	upper	Adjusted — Abuse or Weak Bonding OR	95% CI lower	upper
Daily sleep duration (<6 or ≧10)	1.0	1.5	0.8	2.9	0.9	0.3	2.5	1.1	0.6	1.8	1.0	1.0	0.5	2.0	0.5	0.2	1.6	0.9	0.5	1.5
Taking more than 30 min to fall asleep	1.0	1.9	0.8	4.4	4.2*	1.4	12.9	2.1*	1.0	4.2	1.0	1.0	0.4	2.5	2.3	0.6	8.0	1.5	0.7	3.2
Waking during sleep	1.0	3.1**	1.6	5.9	0.6	0.2	1.8	1.5	0.9	2.6	1.0	2.9**	1.5	5.9	0.6	0.2	2.0	1.5	0.9	2.7
Early morning awaking	1.0	2.7*	1.2	5.8	0.0	—	—	0.7	0.3	1.6	1.0	1.7	0.7	4.1	0.0	—	—	0.5	0.2	1.2
Difficulty waking up in the morning	1.0	0.7	0.4	1.5	1.9	0.7	5.3	1.1	0.6	1.9	1.0	0.5	0.2	1.1	1.1	0.3	3.3	0.8	0.4	1.5
Difficulty breathing during sleep	1.0	1.6	0.6	4.5	0.7	0.1	6.1	1.2	0.5	3.1	1.0	0.8	0.3	2.4	0.3	0.0	2.6	0.7	0.2	1.8
A sense of insufficiency of the sleep	1.0	2.3*	1.2	4.4	0.5	0.2	1.5	1.1	0.6	1.8	1.0	1.4	0.7	2.9	0.2*	0.1	0.8	0.8	0.5	1.5
Sleeping poorly at night	1.0	2.2*	1.1	4.0	0.6	0.2	1.9	1.0	0.6	1.7	1.0	1.5	0.7	2.9	0.4	0.1	1.3	0.8	0.5	1.5

Maternal bonding types

Outcomes: sleeping habits (reference: optimal bonding)	Crude — Optimal Bonding OR	Crude — Affectionless Control OR	95% CI lower	upper	Crude — Affectionate Constraint OR	95% CI lower	upper	Crude — Abuse or Weak Bonding OR	95% CI lower	upper	Adjusted — Optimal Bonding OR	Adjusted — Affectionless Control OR	95% CI lower	upper	Adjusted — Affectionate Constraint OR	95% CI lower	upper	Adjusted — Abuse or Weak Bonding OR	95% CI lower	upper
Daily sleep duration (<6 or ≧10)	1.0	1.4	0.8	2.3	0.9	0.3	2.5	0.9	0.5	1.6	1.0	1.0	0.5	1.9	0.5	0.2	1.7	0.8	0.5	1.4
Taking more than 30 min to fall asleep	1.0	1.2	0.6	2.5	1.0	0.3	3.9	0.9	0.5	1.9	1.0	0.7	0.3	1.6	0.5	1.1	2.2	0.8	3.9	1.7
Waking during sleep	1.0	1.8	1.0	3.2	1.3	0.5	3.6	1.4	0.8	2.3	1.0	1.5	0.8	2.7	1.1	0.4	3.1	1.2	0.7	2.1
Early morning awaking	1.0	1.6	0.7	3.7	2.0	0.5	7.8	2.1	1.0	4.4	1.0	1.0	0.4	2.4	1.2	0.3	5.1	1.9	0.9	4.1
Difficulty waking up in the morning	1.0	0.7	0.4	1.4	0.7	0.2	2.2	0.7	0.4	1.3	1.0	0.9	0.2	1.0	0.4	0.1	1.4	0.6	0.3	1.2
Difficulty breathing during sleep	1.0	2.2	0.9	5.7	2.0	0.4	10.0	2.2	0.9	5.2	1.0	1.6	0.6	4.4	1.1	0.2	6.5	2.1	0.8	5.7
A sense of insufficiency of the sleep	1.0	1.8	1.0	3.2	1.3	0.5	3.6	1.4	0.8	2.3	1.0	1.2	0.7	2.3	0.8	0.3	2.4	1.2	0.7	2.1
Sleeping poorly at night	1.0	1.8	1.0	3.1	1.2	0.4	3.5	1.4	0.8	2.4	1.0	1.3	0.7	2.3	0.8	0.3	2.5	1.2	0.7	2.1

*p<0.05 **p<0.01 ***p<0.001
OR: odds ratio (vs. optimal bonding)

(low care, high protection)" is harmful attitude for mental health, even in adulthood. While measures to be taken from this finding are not clear, for the father to keep high care and moderate protection, parenting support systems and education for fathers would be useful.

It is important to consider whether parental bonding causes sleep disturbance independently from depression and life events as well as the background psychological mechanisms and the influence of recall bias. In this study, sleep disturbances are generally strongly associated with the degree of depression and stressful life events (Table 4). Parental bonding types are also associated with sleep disturbances in univariate analysis (Table 3), but most associations were not significant after adjustment for CES-D and SRRS (Table 5 and also suggested in Figure 1C). These results seemed to suggest that general sleep condition is influenced by parental bonding mostly through developing vulnerability to stressful events which can cause depression. However, in the path analysis (Figure 1D), paternal "care" score was linearly correlated with general sleep condition independently from depression in the overprotected population, in whom independence from parents was suppressed, even with the adjustment. Above all, there may be a direct association between parental bonding and sleep disturbances.

Sleep disturbances are frequently observed in people who make suicide attempts, and these reports suggest that sleep disturbances increase the risk of suicide without going through depression [31, 32]. Furthermore, previous meta-analysis results indicated that the association between sleep disturbances and suicide was also significant, even after adjustment for depression or hopelessness [14, 19, 33]. From the above, it may be possible that sleeping conditions will affect other problems (e.g. suicide) and be influenced by other problems (e.g. parental bonding) without affecting mood condition. This is also important from the viewpoint of therapeutic intervention or prevention. In the previous placebo-controlled trial, subjects with depression in the group of fluoxetine hydrochloride (selective serotonin reuptake inhibitor: SSRI) with eszopiclone, a sleep inducing agent, had been reported to improve more in depression compared to the group of fluoxetine hydrochloride with the placebo [34]. The former group showed a higher remission rate of depression. These findings suggested that the treatment and prevention

for sleep disturbances is important to prevent more severe mental disorders, independently from the presence of depression.

Our study has several limitations. First, although the reliability of PBI has been insured for a retrospective period of 20 years [35], there were some subjects who passed this guarantee period in this study. Moreover, there may be a potential recall bias. Since SRRS score theoretically depends on current life events, it should be independent of past child rearing, unlike depression. However, a strong association is observed, as shown in Table 3. This suggested that current mood and recent events may have influenced the PBI evaluation as a recall bias. Regarding this point, the adjustment of CES-D and SRRS is important for controlling the recall bias. As described above, since direct association between parental bonding and sleep disturbances are observed, it could be interpreted as an independent association from the recall bias. Second, a low response rate could cause a selection bias. There is a possibility that the subjects in our study were healthy people who have a good relationship with parents and a stable life. In addition, the average age was higher than our expectation due to small young populations. Our study subjects were recruited from Otaru City, a northern city in Japan. Depending on such potential selection bias, our study may be limited in generalization. The Small sample size is also a limitation in this study. However, although the sample size is relatively small compared to larger epidemiological studies with tens thousands of people, four hundred subjects is not too small to estimate confidence intervals. With the 400 subjects, the maximum exact confidence intervals for proportion is +/- 5.0%, and statistical power for detecting statistical significance in a comparison of proportions between two groups assuming 15% risk difference is more than 80%. We, therefore, do not consider that the number of subjects is insufficient. Our study provided a meaningful finding that sleep conditions in adulthood are affected by parental bonding type in childhood.

6.　Conclusions

Parental bonding types of low care were associated with sleep disturbances among Japanese men in adulthood. In particular, "affectionless control" tends to increase the risk of "waking during sleep." Paternal "care" score was directly correlated with general sleep disturbances independently from depression in the

overprotected population. Our study raises the possibility that the parental care of a child affects sleep disturbances in adulthood, which can cause severe mental health problems.

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児童期に受けた養育と鬱やライフイベントから独立した成人後の睡眠障害の関連の検討：日本での横断研究

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睡眠障害は，うつや自殺と関連する公衆衛生上の重大な問題である．先行研究によると睡眠障害はうつ病を介さずに自殺のリスクを高めることが示唆されている．一方，うつ病や自殺のリスク要因として近年注目されているのが，両親による児童虐待などの有害な養育態度である．このような有害な養育態度を受けることが，壮年期のうつ病や自殺のリスク増加に関連するという長期的な影響が示されている．本研究では，睡眠障害に焦点を当て，過去の両親の養育態度との関連を質問紙調査によって検討することとした．本横断研究は，日本の地方都市において実施され，対象者は，30 〜65歳までの男性1500人を年代ごとに500人ずつ住民基本台帳から無作為抽出した．調査票は，基本属性，生活習慣，睡眠習慣，Parental Bonding Instrument（PBI），Social Readjustment Rating Scale（SRRS），Self-report depression scale（CES-D）で構成した．対象者から回収された調査票は，400通（回収率26.7%）であった．回答者の平均年齢±標準偏差（範囲）は，48.3±8.6歳（31 〜 63歳）であった．回答者を，PBI の結果を用いて父母ごと4つの養育態度に分類し，睡眠障害との関連についてロジスティック回帰分析を用いて検討した．年齢，CES-D，SRRSの得点を共変量として調整した結果，父親の養育態度において，冷淡な養育と中途覚醒，過保護な養育と熟眠感が関連していた（OR 2.93, 95% CI: 1.46-5.87；OR 0.24, 95% CI: 0.07-0.79）．我々の調査結果は，壮年期男性の睡眠障害に児童期の養育態度が影響するという重要な知見を示唆するものとなった．