

Preventing mood disorders associated with suicide-related behaviors among small- and medium-size enterprise workers in Japan

Takaaki Fukushima

Showa University

Osamu Takashio (✉ takashio@med.showa-u.ac.jp)

Showa University

Akatsuki Kokaze

Showa University

Hidetoshi Sudo

Showa University

Mari Yamada

Showa University

Hideaki Kawai

Showa University

Hiromitsu Uno

Showa University

Tomohiro Yoshida

Showa University

Yukari Tosaka

Showa University

Keita Kawai

Showa University

Yukinori Kamata

Showa University

Yasuhiro Ono

Showa University

Yoshiko Oyama

Showa University

Shunsuke Hirose

Showa University

Akira Iwanami

Showa University

Research Article

Keywords: suicide prevention, small- and medium-size enterprises in Japan, workers, anxiety disorder, mood disorder

Posted Date: March 17th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-243654/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

1 **Preventing mood disorders associated with suicide-related behaviors among small- and**
2 **medium-size enterprise workers in Japan**

3
4
5 Takaaki Fukushima^{1,2)}, Osamu Takashio^{1,2)}, Akatsuki Kokaze³⁾, Hidetoshi Sudo^{1,2)}, Mari
6 Yamada^{1,2)}, Hideaki Kawai^{1,2)}, Hiromitsu Uno^{1,2)}, Tomohiro Yoshida^{1,2)}, Yukari
7 Tosaka^{1,2)}, Keita Kawai^{1,2)}, Yukinori Kamata^{1,2)}, Yasuhiro Ono^{1,2)}, Yoshiko Oyama^{1,2)},
8 Shunsuke Hirose^{1,2)}, Akira Iwanami^{1,2)}

9
10 1) Department of Psychiatry, Showa University School of Medicine, Setagaya-ku, Tokyo 157-
11 8577, Japan

12
13 2) Department of Psychiatry, Showa University Karasuyama Hospital, Setagaya-ku, Tokyo
14 157-8577, Japan

15
16 3) Department of Hygiene, Public Health and Preventive Medicine, Showa University School
17 of Medicine, 1-5-8 Hatanodai, Shinagawa-ku, Tokyo 142-8555, Japan

18
19 **Corresponding author**

20 Correspondence to Osamu Takashio

21
22
23 **Abstract**

24 **Background**

25 While the suicide rate in Japan has recently declined, it is still high from a global perspective.
26 Recently, suicides related to unemployment caused by COVID-19 have increased. In addition,
27 because of increases in *karoshi* and industrial accidents, mental health measures for workers have
28 become an urgent issue. We previously conducted a study that tested whether screening for mood
29 disorders, which were strongly associated with suicide-related behavior, helps prevent suicide in
30 small and medium-size enterprise workers, where mental health support was insufficient. The
31 current study builds on the previous study's findings that mental illness screening helps identify
32 mood disorders and may provide a primary prevention method for suicide.

33
34 **Methods**

35 A total of 1,411 consenting workers were surveyed using the Mini-International Neuropsychiatric
36 Interview (MINI). A representative module of each disease item was extracted and analyzed. The
37 Center for Epidemiological Studies-Depression (CES-D), Bipolar Spectrum Diagnostic Scale (BSDS),
38 Liebowitz Social Anxiety Scale (LSAS-J), and the Sheehan Disability Scale (SDISS) were used as
39 secondary assessments. We compared individuals with depression, bipolar disorder, dysthymia,
40 and mood disorders with a control group. In addition, we conducted multivariate analyses to
41 investigate items that identified individuals with depression, mood dysregulation, bipolar disorder, or
42 all-inclusive mood disorders.

43

44 Results

45 The adjusted odds ratios in the anxiety disorders groups were 3.2 for panic disorder, 2.6 for
46 social anxiety disorder, 2.1 for agoraphobia, and 1.8 for generalized anxiety disorder; 2.1 for
47 obsessive compulsive disorders; and 2.8 for the bulimia nervosa group. These results show a
48 significant correlation with mental illnesses that are referred to as neuroses in a conventional
49 diagnosis.

50

51 Conclusion

52 The study found that screening for anxiety disorders, obsessive-compulsive disorders and
53 eating disorders contributes to preventing mood disorders among workers. We hope that our
54 findings will indirectly contribute to preventing workers' suicides.

55

56 Keywords: suicide prevention, small- and medium-size enterprises in Japan, workers, anxiety
57 disorder, mood disorder

58

59 **Background**

60 According to the National Police Agency, deaths attributed to suicide in Japan numbered

61 20,169 in 2019. According to the WHO database [1], this is the second highest suicide rate

62 among G8 countries, with Russia showing the highest rate. The number of deaths in Japan

63 attributed to suicide among employees/workers (those with a job, excluding self-employed

64 individuals and those working for a family owned company) increased two years in row up to

65 2018. Deaths attributed to industrial accidents such as *karoshi*, including suicide, are also
66 increasing. The COVID-19 pandemic is expected to increase the suicide rate because of
67 increased social anxiety and a stagnant economy. In October 2020, the number of suicides per
68 month dramatically increased. One characteristic of suicide in Japan is that the rate is high
69 among young and middle age people, against a background of social and economic factors.

70 A WHO study found that 80 to 90% of those who committed suicide suffered from some
71 form of mental illness, with about 30% of those suffering from depression [1]. Studies
72 examining who attempted suicide in Japan and psychological autopsy studies are exploring
73 Japan's suicide proportions [2]. Screening for mental illness, including depression, has been
74 shown to be an important first step toward preventing suicide. Tsuchiya et al. [3] administered
75 the WHO World Mental Health Survey (WMHJ2) to assess workers' state of mental health and
76 found that the twelve-month prevalence of mental illness among workers (employees and self-
77 employed) in Japan was 2.6% for major depressive disorder, 2.3% for specific phobia, 1.6% for
78 alcohol misuse, 1.1% for social anxiety disorder (SAD), 1.0% for generalized anxiety disorder
79 (GAD), 0.6% for panic disorder (PD), 0.5% for post-traumatic stress disorder (PTSD), 0.3% for
80 type II bipolar disorder, 0.3% for mood disorder, and 0.1% for agoraphobia (AG) without PD.
81 Health surveys conducted with Japanese workers found that about 60% of the respondents had
82 severe anxiety, worries, and stress about work or professional life. This trend has continued

83 without improvement since 1997. More than 1% of workers suffer from mental illness and
84 continue to work while receiving medical care. Against this background, a stress check system
85 to prevent workers' mental illness was instituted in 2015. While the system principally targets
86 primary illness prevention before onset, its secondary prevention aspect includes early
87 depression diagnosis and early treatment introduction. However, those who committed suicide
88 were unlikely to have been monitored by a medical institution. Louma et al. [4] found that more
89 than half of those who attempted suicide sought some form of medical help within a month of
90 the attempt. A project commissioned by the Ministry of Health, Labour and Welfare showed
91 that 2% of men and 5% of women who attempted suicide but survived sought help from a
92 psychiatric department before the attempt. Similar figures for seeking help from a physical
93 health department were very low, at 0.4% for men and 0.1% for women. In Japan, only one of
94 five patients with mental illness is receiving treatment [5]. To prevent suicide in Japan, we need
95 to identify hidden mental illness among the general population, including workers, and to
96 encourage them to seek help from a psychiatric specialist.

97 Unlike large companies, psychiatric support for small and medium-size enterprises has been
98 insufficient. Because of the background described above, the psychiatric field has been
99 engaging primary prevention activities as part of a suicide prevention and mental health
100 maintenance program for Japan's small- and medium-size enterprise workers since 2008.

101 Experienced psychiatrists conduct one-to-one interviews with workers and provide information
102 and advice on stress management and sleep to prevent mental illness. If judged necessary, they
103 promptly refer patients to a specialist. We analyzed data obtained from mental health activity
104 based on our hypothesis that the key to suicide prevention is early diagnosis of mental illness,
105 including mood disorders. The results showed that, in many cases, mood disorders and anxiety
106 disorder were hidden among those who were thinking of suicide, which suggests that screening
107 for mood disorders that are strongly associated with suicide-related behavior would help prevent
108 suicides [6]. We also believe that given the frequent co-occurrence of mood and anxiety
109 disorders, identifying anxiety disorders would effectively diagnosis mood disorders for suicide
110 prevention. The National Comorbidity Survey Replication (NCS-R) in the US showed that the
111 lifetime prevalence of major depressive disorder accompanied by anxiety disorder is as high as
112 59.2%. The frequency of co-occurring anxiety disorders, including SAD, single phobia, PTSD,
113 GAD, agoraphobia, and PD (in descending order), ranged from 30 to 10% [7]. A category
114 introduced in the DSM-5, ‘accompanied with anxiety-induced pain,’ is thought to increase
115 suicide risk, making the illness more difficult to treat [8]. Co-occurrence of anxiety disorders
116 with bipolar disorder is also very high, with a lifetime prevalence of 74.9%. Co-occurrence rates
117 (in descending order) for SAD, single phobia, GAD, PD, obsessive compulsive disorder (OCD),
118 and PTSD range from about 40 to 10% [9]. The lifetime prevalence for persistent depressive

119 disorder is estimated to be 1.3% in Japan [10], 2.5% in the US [11], and around 1.5% globally
120 [12]. The co-occurrence rates in all anxiety disorder groups show a significant and positive
121 correlation [13]. These findings suggest that screening for anxiety disorders could help identify
122 mood disorders and consequently prevent suicide.

123 As far as we are aware, no other study in Japan or abroad has examined identifying mood
124 disorders and other illnesses to prevent suicide among workers. Research on the relationship
125 between mood disorders and other illnesses from the perspective of suicide prevention is also
126 limited [for example, 14, 15]. Our earlier study reported that workers with mental illness and
127 suicidal ideation are hidden among small- and medium-size enterprise workers and that there
128 are many cases of mood disorder and anxiety disorder hidden among those who are suicidal.
129 This prompted us to suggest that screening for mood disorders that are strongly correlated with
130 suicide-related behavior could help prevent suicide [6]. The current study was conducted with
131 the aim of preventing suicide by screening workers for mood disorders that have a strong
132 correlation with suicide-related behavior. Since mental illness is strongly correlated with mood
133 disorders, including depression, dysthymia, and bipolar disorder, diagnosing mental illness
134 could help to prevent suicide; we therefore aimed to test the hypothesis of a correlation between
135 mood disorders and other mental illnesses among Japanese workers.

136 **Methodology**

137 ***Participants***

138 The study was conducted with workers who consented to the use of data obtained from mental
139 health activities based on psychiatric health checks conducted in October and November of 2014.

140 ***Research design***

141 This was a retrospective survey. To ensure anonymity, workers from multiple small- and
142 medium-size enterprises were studied.

143 ***Data sources***

144 We asked research participants to complete an established psychiatric scale in addition to our
145 own questionnaire as part of a mental health activity based on a psychiatric health check. To more
146 precisely identify mental illness, we informed research participants that personal information was
147 fully protected and no information gained from the questionnaire would be passed on to their
148 employer. However, we decided to liaise with the occupational health physician or those in charge
149 of occupational health at the company if the respondent showed agitation, psychomotor agitation,
150 or urgent suicide-related behavior that was beyond the study's duty of care. However, no
151 respondents in the present study fell into this category. For this analysis, we used data from the
152 evaluation scale whose reliability and validity have been proven, but excluded responses to our
153 questionnaire.

154 ***Evaluation scales***

155 We used the Mini-International Neuropsychiatric Interview (MINI) as the primary evaluation
156 instrument [16]. To prioritize identifying mental illness, we selected a representative module of
157 each MINI illness item for this study.

158 For supplementary evaluation, we used the Japanese version of the Center for Epidemiological
159 Studies – Depression (CES-D) and the Japanese version of the Bipolar Spectrum Diagnostic Scale
160 (BSDS) to evaluate depression and bipolar disorder among mood disorders [17, 18]. We used the
161 Japanese version of the Liebowitz Social Anxiety Scale (LSAS-J) to assess symptoms of social
162 anxiety disorder, which is said to be prevalent among Japanese people [19]. To evaluate social
163 function and quality of life, we used the Japanese version of the Sheehan Disability Scale (SDISS)
164 [20].

165 *Analysis methods*

166 Age and the number of years of consecutive service were treated as continuous variables and
167 gender as a categorical variable. Since the MINI produces data about symptoms that are
168 characteristic of mental illness, it was used as a categorical variable. Furthermore, when either
169 depressiveness or loss of interest was checked, the participant was categorized into the depression
170 group; when either high spiritedness or increased irritability was checked, the individual was
171 categorized as the bipolar group. When either obsession or obsessive behavior was checked, the
172 individual was categorized as the obsessive compulsive disorder group, and when either of

173 traumatic experience, a sense of powerlessness/fear or flashback was checked, the individual was
174 categorized as in the PTSD group. CES-D, BSDS, LSAS-J, and SDISS scores were treated as
175 continuous variables.

176 We then divided the research participants into two groups: a mood disorder group, including
177 depression, dysthymia, bipolar disorder, and all mood disorders and the control group. We then
178 conducted statistical analysis on survey items (gender, age, the number of years of continuous
179 service, CES-D, BSDS, LSAS-J, SDISS, and MINI other than CES-D, BSDS, LSAS-J, and
180 SDISS). Furthermore, multivariate analysis was conducted to identify items that exercise strong
181 influence on depression, dysthymia, bipolar disorder, and all mood disorders. Since there was a
182 possibility that the high correlation among depression, dysthymia, bipolar disorder, and all mood
183 disorders group could exert influence on the multivariate analysis results, we checked
184 multicollinearity using multiple regression analysis.

185 The univariate analysis statistical examination used the t-test and chi-squared test. The
186 multivariate analysis had $p < 0.05$ as the significance level using forced entry in the logistic
187 regression model. We used IBM SPSS Statistics ver. 22 (SPSS Inc., Tokyo, Japan) for statistical
188 analysis.

189 ***Ethical considerations***

190 The study was approved by the clinical trial assessment committee of Showa University
191 Karasuyama Hospital, and confirmed that all the methods were performed in accordance with the
192 Declaration of Helsinki. Each worker was informed that personal information would be protected
193 in the study both orally and in writing and signed the informed consent document. In addition, we
194 ensured anonymity by researching several small and medium-sized enterprises. There was no
195 conflict of interest in the relationship between the research participants and their companies, the
196 third-party mediating institutions, and the researchers.

197

198 **Results**

199 *Participant overview*

200 Participant characteristics are shown in Table 1. A total of 1,411 workers (male: 1,047, female:
201 364, average age: 40.1 ± 10.3 years), were recruited. Most were from workplaces where the
202 number of male workers was three times that of female workers, so more men than women
203 participated. Most participants were in their forties.

204 Approximately 30% of male participants and 30% of female participants were in one of the
205 mood disorders groups. Their mean CES-D score was about 18 points and the mean LSAS-J was
206 about 47 points, which exceeded the cut-off. Their mean BSDS score was approximately 6 points.

207 Approximately 8% of all participants were in the depression group. Their mean CES-D score
208 was about 28 points, and mean BSDS score was about 7 points. Their mean LSAS-J score was
209 high at approximately 60 points.

210 The dysthymia group accounted for about 3% of all participants. Their mean CES-D score was
211 about 30 points, and mean BSDS score was about 7 points. The mean LSAS-J score was high at
212 approximately 59 points.

213 The bipolar disorder group comprised approximately 25% of all participants. Their mean CES-
214 D score was about 17 points, and mean BSDS score was about 6 points. The mean LSAS-J score
215 was approximately 45 points.

216 There were significant between-group differences in the CES-D and LSAS-J scores; the
217 difference between the depression and dysthymia groups was more than ten points.

218 In all groups, the SDISS showed disordered communication was high in all tested situations:
219 academic/work environment, leisure/home environment, and at home. While the control group's
220 score was about 1 point, all other groups scored higher by 2 to 4 points.

221 Table 2 in the mood disorders and control groups shows the MINI results for the main
222 evaluation of identified items that correlated with other illness groups. Statistically significant
223 differences between the mood disorder group's gross odds ratios were about 9 for the panic
224 disorder group and about 6 for both the drug misuse group and obsessive-compulsive disorder

225 group. The agoraphobia, social anxiety disorder, and generalized anxiety groups' gross odds
226 ratios were about 5. No significant difference was found in the anorexia mentalis group.

227 Table 2 in the depression and control groups shows the main MINI evaluation items'
228 correlation comparisons with other illnesses. The statistically significant gross odds ratios for the
229 depression group were about 18 for the dysthymia group, about 16 for the drug misuse group,
230 about 10 for the obsessive-compulsive disorder group, about 8 for the generalized anxiety disorder
231 and panic disorder groups, and about 7 in the social anxiety disorder group. In addition, the scores
232 for the agoraphobia, psychotic disorder, bulimia nervosa, and bipolar disorder groups were about
233 3 to 5. There was no significant difference in the alcohol misuse group.

234 Table 2 in the dysthymia and control groups shows the major MINI item comparisons with
235 other illnesses. The statistically significant gross odds ratios for the dysthymia group were about
236 18 for the depression group, about 14 for the drug misuse group, about 13 for the generalized
237 anxiety disorder group, about 12 for the obsessive-compulsive disorder group, and about 7 in the
238 panic disorder group.

239 Table 2 in the bipolar disorder and control groups shows the MINI results comparisons with
240 other illnesses. The statistically significant gross odds ratios for the bipolar disorder group were
241 about 6 for the panic disorder group and about 4 for the psychotic disorder, agoraphobia, and

242 social anxiety disorder groups. There were no significant differences in the anorexia mentalis and
243 drug misuse groups.

244 Table 3 shows the results of the multivariate analysis of the mood disorders group and other
245 illness groups. The statistically significant adjusted odds ratios were about 3.2 for the panic
246 disorder group, about 2.8 for the bulimia nervosa group, about 2.6 for the social anxiety disorder
247 group, about 2.1 for the agoraphobia and obsessive-compulsive disorder groups, about 1.8 for the
248 generalized anxiety disorder group, and about 1.7 for the PTSD group. The other items showed
249 no significant results.

250 Table 3 also shows the results of the multivariate analysis for the depression and other illness
251 groups. The statistically significant adjusted odds ratios were approximately 3.6 for the obsessive-
252 compulsive disorder group, about 2.7 for the social anxiety disorder group, about 2.7 for the
253 generalized anxiety disorder group, about 2.4 for the panic disorder group, and about 1.8 for the
254 bulimia nervosa group. No significant results were found for the other items.

255 Furthermore, Table 3 shows the results for the dysthymia group. The statistically significant
256 adjusted odds ratios were about 7 for the generalized anxiety disorder group, about 5 for the
257 obsessive-compulsive disorder group, and about 3.3 for the anorexia mentalis group. No
258 significant results were found for the other items.

259 Table 3 also shows the results for the bipolar disorder group. The statistically significant
260 adjusted odds ratios were about 2.5 for the panic disorder group, 2.3 for the bulimia nervosa group,
261 about 2 for the drug misuse group, about 1.9 for the agoraphobia group, about 1.8 for the social
262 anxiety disorder group, and about 1.7 for the PTSD group. The other items showed no significant
263 results.

264 The statistical analysis of each group showed that the variance inflation factor was below 10
265 for all groups, and there was no multicollinearity among the explanatory variables.

266

267 **Discussion**

268 Based on the hypothesis that screening for mental illness may provide a primary suicide
269 prevention method, we divided research participants from a previous study into mood disorders,
270 depression, dysthymia, bipolar disorder, and controls and compared their relationships with each
271 mental illness group. Our multivariate analysis showed that in the mood disorder group, the
272 relationships were about 3.2 for the panic disorder group, approximately 2.8 for the bulimia
273 nervosa group, and about 2.6 for the social anxiety disorder group. In the depression group, it was
274 about 3.6 for the obsessive- compulsive disorder group, about 2.7 for the social anxiety disorder
275 group, and about 2.7 for the generalized anxiety disorder group. In the dysthymia group, it was
276 about 7 in the generalized anxiety disorder group, about 5 in the obsessive-compulsive disorder

277 group, and about 3.3 in the anorexia mentalis group. In the bipolar disorder group, it was about
278 2.5 for the panic disorder group and about 2.3 for the bulimia nervosa group. These results suggest
279 significant correlations between mood disorder and other mental illnesses. Previous studies have
280 shown that anxiety disorders, such as panic disorder, social anxiety disorder, and generalized
281 anxiety disorder, have particularly strong correlations. This suggests that screening for anxiety
282 disorders could lead to early diagnosis and treatment of mood disorders that are associated with
283 suicide-related behavior.

284 In the panic disorder and agoraphobia groups, significant correlations were found between the
285 mood disorder, depression, and bipolar disorder groups. Although AG was previously thought to
286 be a consequence of PD, it has become an independent diagnostic category in the DSM-5. The
287 NCS-R reported that the lifetime prevalence of PD without AG is 3.7% and that of PD with AD
288 is 1.1% [21]. The WMHJ2 in Japan reported the lifetime prevalence of PD as 0.4% for men and
289 0.7% for women, and AG without a medical history of PD as 0.3% for men and 0.5% for women.
290 Like other anxiety disorders, PD is more frequently found in women. In addition, PD tends to co-
291 occur with other, non-anxiety mental illnesses; the DSM-5 noted the possibility of PD being
292 ‘applicable to non-anxiety disorder as well as anxiety disorder.’ The lifetime prevalence of
293 depression with PD is high at 55.6% [22]. The co-occurrence rate of bipolar disorder with PD is
294 said to be around 20% [23]; it has been further reported that a neurotic tendency is a clinical

295 characteristic and anxiety sensitivity is related to severity [24]. Vignoli et al. studied workplace
296 phobic anxiety and reported that panic attacks related to the workplace or work were one
297 manifestation [25]. Since workers in the Tokyo metropolitan area commute on busy trains, we
298 believe that workers should be screened for phobic anxiety.

299 In the social anxiety disorder group, we found significant correlations with the mood disorder,
300 depression, and bipolar disorder groups. The NCS-R reported the lifetime prevalence of SAD as
301 12.1%, which is the highest among anxiety disorders except for specific phobias [26]. Seventy
302 percent of cases are reported to be female; other characteristics include young, low income, low
303 academic achievement, and being single, separated, or divorced [27]. Onset is at 14.3 years on
304 average [28]. According to WMHJ2, the lifetime prevalence is 1.8% and the twelve-month
305 prevalence is 1.0%. The German National Health Interview and Examination Survey (GHS-
306 MHS) reported that in 87.8% of SAD cases, one or more mental illnesses co-occurred; patients
307 had one mental illness 20% of cases, two mental illnesses in 20% of cases, and three or more
308 mental illnesses in 60% of cases. SAD is often accompanied by other anxiety disorders, with
309 localized phobia, PD, and GAD found in approximately 20 to 30% of cases. Apart from anxiety
310 disorder, the mood disorder group comprised 65.3%; 50.5% of which had major depressive
311 disorder and 38.1% had dysthymia [29]. In many cases, SAD appears before other illnesses; when
312 accompanied by depression, suicidal ideation becomes more frequent [30]. Even when not

313 accompanied by depression, many cases of anxiety disorder lead to suicide [31]. Compared to
314 those with other anxiety disorders, workers with SAD perform significantly worse in the
315 workplace, and are twice as likely to be expected to work even if they are unemployed. It is
316 expected that their job performance skills are maintained except in a socializing context [32]. As
317 *taijin kyofusho* is globally known as an illness that is peculiar to Japanese culture, it is likely that
318 SAD is hidden among many workers in Japan.

319 In the generalized anxiety disorder group, significant correlations were found with the mood
320 disorder, depression, and dysthymia groups. The lifetime prevalence of GAD is reported to be
321 5.8%, with a twelve-month prevalence of 3.1% according to NCS-R [13]. WMHJ2 reported the
322 prevalence as 1.6% and 0.6%, respectively. Only 30% of individuals with GAD consulted with
323 psychiatric professionals, and only 18% consulted with medical professionals, including
324 psychosomatic medical professionals. Many individuals with anxiety disorders do not receive
325 medical treatment, and this is not limited to GAD [10]. Some sufferers consult with experts in
326 internal, cardiovascular, respiratory, or gastroenterological medicine chiefly complaining of
327 physical pain [33]. Progress is chronic and the condition can worsen with deterioration of family
328 relationships, co-occurrence of cluster C personality disorder, or an I-axis disorder [34]. Studies
329 have shown that GAD precedes depression and predicts its onset; contributes to increased
330 depression; and increases the risk of suicide attempts [35]. Therefore, intervention at an early

331 stage is important [36]. GAD is often accompanied by other illnesses, and their lifetime co-
332 occurrence rate could reach 90%, including depression (62.4%), dysthymia (39.5%), alcohol
333 dependency (37.6%), and PD (23.5%) [33]. While our study did not find a significant result, the
334 co-occurrence of bipolar disorder and GAD is reported to be about 12% [37]. Our results showed
335 a strong correlation between the depression group, which is estimated to be hidden among workers
336 with chronic anxiety related to the work environment, and the dysthymia group; therefore, we
337 regard GAD prevention as important for preventing suicide.

338 In the obsessive-compulsive disorder group, we found significant correlations with the mood
339 disorder, depression, and dysthymia groups. Although there are no large-scale epidemiological
340 data in Japan, the prevalence rate is estimated to be 1%–2%. The lifetime prevalence of mental
341 illnesses accompanying OCD has been reported as major depressive disorder (65.9%), dysthymia
342 (24.0%), SAD (23.4%), PD (23.4%), GAD (18.3%), AG (17.7%), bipolar disorder (12.3%), and
343 BN (9.6%) [38]. Major depressive order is very frequent, which could be explained by
344 psychological conflict and mental fatigue related to OCD or functional problems in everyday or
345 social life. A survey of workers with OCD with hoarding symptoms showed that more severe
346 hoarding symptoms are associated with more severe problems at work because symptoms are
347 directly linked to problems at the workplace. Moreover, troubled relationships with colleagues
348 and a lack of concentration leads to problems in daily life and work performance [39]. Our study

349 did not find any significant correlation between OCD and bipolar disorder; their co-occurrence
350 rate has been reported as 10 to 20% of bipolar disorder cases [40]. Screening for obsessive-
351 compulsive disorder could prevent workers from developing depression because they are
352 exhausted by excessive confirmatory work. In the PTSD group, significant correlations were
353 found between the mood disorder and bipolar disorder groups. The lifetime prevalence of PTSD
354 in Japan is reported to be 0.7%, with a twelve-month prevalence of 1.3% [41]. Since it is unlikely
355 that many employers are aware of PTSD among workers, we need to start with education.

356 In the anorexia mentalis group, significant correlations were found with the dysthymia group
357 and the bulimia nervosa group showing correlations with the mood disorder, depression, and
358 bipolar disorder groups. The Ministry of Health, Labour and Welfare reported that in 2016 there
359 were approximately 210,000 individuals with ED in Japan. The number of individuals with BN
360 is reported to be just below 40,000. Early intervention is important for workers who manage stress
361 through eating behavior.

362 In the drug misuse group, significant correlations were found with the bipolar disorder group.
363 A Ministry of Health, Labour and Welfare study reported that the co-occurrence rate of mood
364 disorder not directly triggered by drug misuse was 9.6%, which is the second highest rate,
365 following anxiety disorder/neurosis at 12.9%. Although we do not expect to find many drug
366 abusers among workers, this illness cannot be overlooked in screening.

367 SAD, AG, PG, and GAD, which are conventionally classified as neuroses, are reorganized as
368 ‘anxiety disorder’ in the DSM-5, and are now in a single category with separation anxiety and
369 akinetic mutism. OCD has been reclassified as an independent category of ‘obsessiveness and its
370 related disorder’ and PTSD and acute stress disorder are now classified as ‘trauma and stress
371 related disorder’ together with adaptive disorder. Our findings suggest that mental illnesses that
372 fit the classical sense of neurosis have significantly strong correlations with mood disorders. Since
373 anxiety disorder generally has an early onset [28], it is said that mood disorders lead to anxiety
374 disorders. If this is the case, the illness is likely to become severe and chronic, increasing the
375 suicide risk. Workers’ anxiety disorders can worsen through their work and become work
376 performance obstacles, which can then induce mood disorders, further complicating the illness.
377 Since OCD, PTSD, and ED are classified as neuroses in the bigger scheme, identifying workers’
378 mental illnesses seen as neuroses in a conventional sense may suppress the onset of mood
379 disorders and contribute to preventing suicide.

380 One limitation of the current study is that it focused on white-collar male workers in the Tokyo
381 metropolitan area; therefore, the findings cannot be broadly generalized. In addition, because we
382 used a self-administered evaluation scale, diagnosis and evaluation were limited. Furthermore,
383 we did not conduct a longitudinal evaluation. Since mental illness diagnoses could change through
384 the course of development, it is necessary to monitor progress over the long term. Wang et al.

385 [42] investigated sleep disorders as a mental illness related to suicidal risk and reported that
386 nightmares and insomnia could increase the suicide risk in patients with depression. This and
387 other similar illnesses need to be the focus of future research.

388 **Conclusion**

389 The present study findings suggest that screening workers for mental illnesses that fall under
390 the conventional category of neurosis, such as anxiety disorder, may help to prevent the onset of
391 mood disorders and suicide. It is hoped that more research will be conducted to help prevent
392 suicide, and to enhance economic activity by identifying mental illnesses hidden among
393 workers.

394

395 **Abbreviations**

396 WHO: World Health Organization
397 WMHJ2: The World Mental Health Survey Second
398 SAD: Social anxiety disorder
399 GAD: Generalized anxiety disorder
400 PD: Panic disorder
401 PTSD: Post traumatic stress disorder
402 AG: Agoraphobia
403 NCS-R: National Comorbidity Survey Replication
404 OCD: Obsessive-compulsive disorder
405 MINI: The Mini-International Neuropsychiatric Interview
406 CES-D: Center for Epidemiological Studies-Depression
407 BSDS: Bipolar Spectrum Diagnostic Scale
408 LSAS-J: Liebowitz Social Anxiety Scale
409 SDISS: Sheehan Disability Scale
410 GHS -MHS: German National Health Interview and Examination Survey
411 BN: Bulimia nervosa

412 ED: Eating disorders

413

414 **Declarations**

415

416 **Ethics approval and consent to participate**

417 The study was approved by the clinical trial assessment committee of Showa University
418 Karasuyama Hospital, and confirmed that all the methods were performed in accordance with
419 the Declaration of Helsinki. Each worker was informed that personal information would be
420 protected in the study both orally and in writing and signed the informed consent document. In
421 addition, we ensured anonymity by researching several small and medium-sized enterprises.
422 There was no conflict of interest in the relationship between the research participants and their
423 companies, the third-party mediating institutions, and the researchers.

424

425 **Consent for publication**

426 Not applicable.

427

428 **Availability of data and materials**

429 The data are available from the corresponding authors upon reasonable request.

430

431 **Competing interests**

432 The authors declare that they have no competing interests.

433

434 **Funding**

435 No funding was provided for this study.

436

437 **Authors' contributions**

438 TF and OT designed the study, performed statistical analysis, interpreted the data, and wrote the
439 paper. HS, MY, HK, HU, and TY participated in the study conception. YT, KK, YK, YO, YO,
440 and SH collected, entered, and organized data. AK managed and conducted the statistical
441 analyses and checked the final manuscript, especially with regard to data. AI revised the
442 manuscript to develop the final manuscript. All authors have approved the final manuscript.

443

444 **Acknowledgements**

445 Mr. AZEKAWA Kazuhiro, Ms. IRIE Mari, and Ms. OOBA Rie of MHI Co., Limited, have
446 helped us tremendously. We would like to deeply thank them for their support in protecting the
447 personal information of research participants in the current study and in all research.

448

449

450 **References**

- 451 1. World Health Data Platform / GHO >Themes >Mental health>Suicide data
452 <https://www.who.int/teams/mental-health-and-substance-use/suicide-data> Accessed 20
453 Dec 2020.
- 454 2. Asukai N. [Mental disorder as a risk factor of suicide; a clinical study of failed
455 suicides]. *Seishin Shinkeigaku Zasshi*. 1994;96(6):415-43. Japanese. PMID: 7938308.
- 456 3. Tsuchiya M, Kawakami N, Ono Y, Nakane Y, Nakamura Y, Fukao A, Tachimori H,
457 Iwata N, Uda H, Nakane H, Watanabe M, Oorui M, Naganuma Y, Furukawa TA,
458 Kobayashi M, Ahiko T, Takeshima T, Kikkawa T. Impact of mental disorders on work
459 performance in a community sample of workers in Japan: the World Mental Health
460 Japan Survey 2002-2005. *Psychiatry Res*. 2012 Jun 30;198(1):140-5. doi:
461 10.1016/j.psychres.2011.10.014. Epub 2012 Feb 27. PMID: 22374551.
- 462 4. Luoma JB, Martin CE, Pearson JL. Contact with mental health and primary care
463 providers before suicide: a review of the evidence. *Am J Psychiatry*. 2002
464 Jun;159(6):909-16. doi: 10.1176/appi.ajp.159.6.909. PMID: 12042175; PMCID:
465 PMC5072576.
- 466 5. Ishikawa H, Kawakami N, Kessler RC. World Mental Health Japan Survey
467 Collaborators. Lifetime and 12-month prevalence, severity, and unmet need for
468 treatment of common mental disorders in Japan: results from the final dataset of the
469 World Mental Health Japan Survey. *Epidemiol Psychiatr Sci*. 2016 Jun;25(3):217-29.
470 doi: 10.1017/S2045796015000566. Epub 2015 Jul 7. PMID: 26148821; PMCID:
471 PMC5144586.
- 472 6. Funako T, Takashio O, Igarashi R, Harada A, Ohta M, Omori Y, Sato A, Sawanobori
473 Y, Toki T, Nakamur Y, Fukushima T, Shimizu H, Sanada K, Yamada H, Iwanami
474 A, Kawaguchi Y, Minegishi G. Suicide prevention for Japanese employees at small and
475 medium-sized enterprises using the Showa university style psychiatric health check-up.
476 *Journal of The Showa University Society*. 2018;78:38-47.
477 <https://doi.org/10.14930/jshowaunivsoc.78.38>
- 478 7. Kessler RC, Berglund P, Demler O, et al. The Epidemiology of Major Depressive
479 Disorder: Results from the National Comorbidity Survey Replication (NCS-
480 R) *JAMA*. 2003;289(23):3095-105. doi:10.1001/jama.289.23.3095
- 481 8. Fava M, Rush AJ, Alpert JE., et al., Difference in treatment outcome in outpatients with
482 anxious versus nonanxious depression: a STAR*D report. *Am J Psychiatry*. 2008;165:
483 342-51. <https://doi.org/10.1176/appi.ajp.2007.06111868>

- 484 9. Merikangas KR, Akiskal HS, Angst J et al. Lifetime and 12-month prevalence of
485 bipolar spectrum disorder in the National Comorbidity Survey replication. *Arch Gen*
486 *Psychiatry*. 2007;64(5):543-552. doi:10.1001/archpsyc.64.5.543
- 487 10. Ishikawa H, Kawakami N, Kessler RC. World Mental Health Japan Survey
488 Collaborators. Lifetime and 12-month prevalence, severity, and unmet need for
489 treatment of common mental disorders in Japan: results from the final dataset of the
490 World Mental Health Japan Survey. *Epidemiol Psychiatr Sci*. 2016 Jun;25(3):217-29.
491 doi: 10.1017/S2045796015000566. Epub 2015 Jul 7. PMID: 26148821; PMCID:
492 PMC5144586.
- 493 11. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime
494 prevalence and age-of-onset distributions of DSM-IV disorders in the National
495 Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005 Jun;62(6):593-602. doi:
496 10.1001/archpsyc.62.6.593. Erratum in *Arch Gen Psychiatry*. 2005 Jul;62(7):768.
- 497 12. Vos T. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and
498 injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010.
499 *Lancet*. 2012;380(9859): 2163-96.
- 500 13. Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity,
501 and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey
502 Replication. *Arch Gen Psychiatry*. 2005;62(6):617-27. doi: 10.1001/archpsyc.62.6.617.
503 Erratum in *Arch Gen Psychiatry*. 2005;62(7):709.
- 504 14. Ono Y, Awata S, Iida H, Ishida Y, Ishizuka N, Iwasa H, Kamei Y, Motohashi Y,
505 Nakagawa A, Nakamura J, Nishi N, Otsuka K, Oyama H, Sakai A, Sakai H, Suzuki Y,
506 Tajima M, Tanaka E, Uda H, Yonemoto N, Yotsumoto T, Watanabe N. A community
507 intervention trial of a multimodal suicide prevention program in Japan: a novel
508 multimodal community intervention program to prevent suicide and suicide attempt in
509 Japan, NOCOMIT-J. *BMC Public Health*. 2008;8:315. doi: 10.1186/1471-2458-8-315.
510 PMID: 18793423; PMCID: PMC2551615.
- 511 15. Hirayasu Y, Kawanishi C, Yonemoto N, Ishizuka N, Okubo Y, Sakai A, Kishimoto T,
512 Miyaoka H, Otsuka K, Kamijo Y, Matsuoka Y, Aruga T. A randomized controlled
513 multicenter trial of post-suicide attempt case management for the prevention of further
514 attempts in Japan (ACTION-J). *BMC Public Health*. 2009;9:364. doi: 10.1186/1471-
515 2458-9-364. PMID: 19781096; PMCID: PMC2760885
- 516 16. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T,
517 Baker R, Dunbar GC. The Mini-International Neuropsychiatric Interview (M.I.N.I.):
518 The development and validation of a structured diagnostic psychiatric interview for

- 519 DSM-IV and ICD-10. *J Clin Psychiatry*. 1998;59 Suppl 20:22-33;quiz 34-57. PMID:
520 9881538.
- 521 17. Radloff LS. The CES-D Scale: a self-report depression scale for research in the general
522 population. *Appl Psychol Meas*. 1977;1:385-401.
523 <https://doi.org/10.1177/014662167700100306>
- 524 18. Nassir Ghaemi S, Miller CJ, Berv DA, Klugman J, Rosenquist KJ, Pies RW. Sensitivity
525 and specificity of a new bipolar spectrum diagnostic scale *J Affect Disord*. 2005
526 Feb;84(2-3):273-7. doi: 10.1016/S0165-0327(03)00196-4. PMID: 15708426.
- 527 19. Liebowitz MR. Social phobia. *Mod Probl Pharmacopsychiatry* 1987;22:141-73.
528 doi: 10.1159/000414022. PMID: 2885745.
- 529 20. Sheehan DV, Harnett-Sheehan K, Raj BA. The measurement of disability. *Int*
530 *Clin Psychopharmacol*. 1996 Jun;11 Suppl 3:89-95. doi: 10.1097/00004850-
531 199606003-00015. PMID: 8923116.
- 532 21. Kessler RC, Chiu WT, Jin R, Ruscio AM, Shear K, Walters EE. The
533 epidemiology of panic attacks, panic disorder, and agoraphobia in the National
534 Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2006;63(4):415–424.
535 doi:10.1001/archpsyc.63.4.415
- 536 22. Kessler RC, Stang PE, Wittchen H, Ustun TB, Roy-Burne PP, Walters EE. Lifetime
537 Panic-Depression Comorbidity in the National Comorbidity Survey. *Arch Gen*
538 *Psychiatry*. 1998;55(9):801–808. doi:10.1001/archpsyc.55.9.801
- 539 23. Birmaher B, Kennah A, Brent D, Ehmann M, Bridge J, Axelson D. Is bipolar disorder
540 specifically associated with panic disorder in youths? *J Clin Psychiatry*. 2002
541 May;63(5):414-9. doi: 10.4088/jcp.v63n0507. PMID: 12019666.
- 542 24. Simon NM, Otto MW, Fischmann D, Racette S, Nierenberg AA, Pollack MH, Smoller
543 JW. Panic disorder and bipolar disorder: anxiety sensitivity as a potential mediator of
544 panic during manic states. *J Affect Disord*. 2005 Jul;87(1):101-5. doi:
545 10.1016/j.jad.2005.02.004. PMID: 15894380.
- 546 25. Vignoli M, Muschalla B, Mariani MG. Workplace Phobic Anxiety as a Mental Health
547 Phenomenon in the Job Demands-Resources Model *Biomed Res Int*.
548 2017;2017:3285092. doi: 10.1155/2017/3285092. Epub 2017 Nov 29. PMID:
549 29318143; PMCID: PMC5727632.
- 550 26. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime
551 prevalence and age-of-onset distributions of DSM-IV disorders in the National
552 Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005 Jun;62(6):593-602. doi:
553 10.1001/archpsyc.62.6.593. Erratum in *Arch Gen Psychiatry*. 2005 Jul;62(7):768.

- 554 27. Schneier FR, Johnson J, Hornig CD, Liebowitz MR, Weissman MM. Social
555 Phobia: Comorbidity and Morbidity in an Epidemiologic Sample Arch Gen
556 Psychiatry. 1992;49(4):282–288. doi:10.1001/archpsyc.1992.01820040034004
- 557 28. Lijster JM, Dierckx B, Utens EM, Verhulst FC, Zieldorff C, Dieleman GC, Legerstee
558 JS. The Age of Onset of Anxiety Disorders Can J Psychiatry. 2017 Apr;62(4):237-246.
559 doi: 10.1177/0706743716640757. Epub 2016 Jul 9. PMID: 27310233; PMCID:
560 PMC5407545.
- 561 29. Fehm L, Beesdo K, Jacobi F, Fiedler A. Social anxiety disorder above and below the
562 diagnostic threshold: prevalence, comorbidity, and impairment in the general
563 population. Soc Psychiatry Psychiatr Epidemiol. 2008 Apr;43(4):257-65. doi:
564 10.1007/s00127-007-0299-4. Epub 2007 Dec 14. PMID: 18084686.
- 565 30. Nepon J, Belik SL, Bolton J, Sareen J. The relationship between anxiety disorders and
566 suicide attempts: Findings from the National Epidemiologic Survey on Alcohol and
567 Related Conditions. *Depress Anxiety*. 2010;27(9):791-8. doi: 10.1002/da.20674. PMID:
568 20217852; PMCID: PMC2940247.
- 569 31. Thibodeau MA, Welch PG, Sareen J, Asmundson GJ. Anxiety disorders are
570 independently associated with suicide ideation and attempts: propensity score matching
571 in two epidemiological samples. *Depress Anxiety*. 2013;30(10):947-54. doi:
572 10.1002/da.22203. PMID: 24108489.
- 573 32. Moitra E, Beard C, Weisberg RB. Occupational impairment and social anxiety disorder
574 in a sample of primary care patients *J Affect Disord*. 2011;130(1-2):209-12. doi:
575 10.1016/j.jad.2010.09.024. Epub 2010 Oct 12. PMID: 20934220; PMCID:
576 PMC3831271.
- 577 33. Wittchen HU, Zhao S, Kessler RC, Eaton WW. DSM-III-R generalized anxiety disorder
578 in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1994;51(5):355-64. doi:
579 10.1001/archpsyc.1994.03950050015002. PMID: 8179459.
- 580 34. Weisberg RB. Overview of generalized anxiety disorder: epidemiology, presentation,
581 and course *J Clin Psychiatry*. 2009;70 Suppl 2:4-9. PMID: 19371500.
- 582 35. Wittchen HU, Hoyer J. Generalized anxiety disorder: nature and course. *J Clin*
583 *Psychiatry*. 2001;62 Suppl 11:15-9; discussion 20-1. PMID: 11414546.
- 584 36. Li Y, Shi S, Yang F, Gao J, Li Y, Tao M, Wang G, Zhang K, Gao C, Liu L, Li K, Li K,
585 Liu Y, Wang X, Zhang J, Lv L, Wang X, Chen Q, Hu J, Sun L, Shi J, Chen Y, Xie D,
586 Flint J, Kendler KS, Zhang Z. Patterns of co-morbidity with anxiety disorders in
587 Chinese women with recurrent major depression. *Psychol Med*. 2012;42(6):1239-48.
588 doi: 10.1017/S003329171100273X. Epub 2011 Nov 30. PMID: 22126712; PMCID:
589 PMC3339636.

- 590 37. Preti A, Girolamo Gd, Vilagut G, Alonso J, Graaf Rd, Bruffaerts R, Demyttenaere K,
591 Pinto-Meza A, Haro JM, Morosini P, ESEMeD-WMH Investigators. The epidemiology
592 of eating disorders in six European countries: results of the ESEMeD-WMH project. *J*
593 *Psychiatr Res.* 2009;43(14):1125-32. doi: 10.1016/j.jpsychires.2009.04.003. Epub 2009
594 May 8. PMID: 19427647.
- 595 38. LaSalle VH, Cromer KR, Nelson KN, Kazuba D, Justement L, Murphy DL. The
596 diagnostic interview assessed neuropsychiatric disorder comorbidity in 334 individuals
597 with obsessive-compulsive disorder. *Depress Anxiety.* 2004;19(3):163-73. doi:
598 10.1002/da.20009. PMID: 15129418.
- 599 39. Mathes BM, Henry A, Schmidt NB, Norberg MM. Hoarding symptoms and workplace
600 impairment *Br J Clin Psychol.* 2019;58(3):342-356. doi: 10.1111/bjc.12212. Epub 2018
601 Dec 11. PMID: 30548281.
- 602 40. Joshi G, Wozniak J, Petty C, Vivas F, Yorks D, Biederman J, Geller D. Clinical
603 characteristics of comorbid obsessive-compulsive disorder and bipolar disorder in
604 children and adolescents. *Bipolar Disord.* 2010;12(2):185-95. doi: 10.1111/j.1399-
605 5618.2010.00795.x. PMID: 20402711; PMCID: PMC2864069.
- 606 41. Kawakami N, Tsuchiya M, Umeda M, Koenen KC, Kessler RC. World Mental Health
607 Survey Japan. Trauma and posttraumatic stress disorder in Japan: results from the
608 World Mental Health Japan Survey. *J Psychiatr Res.* 2014;53:157-65. doi:
609 10.1016/j.jpsychires.2014.01.015. Epub 2014 Feb 6. PMID: 24572682; PMCID:
610 PMC4169235.
- 611 42. Wang, X., Cheng, S. & Xu, H. Systematic review and meta-analysis of the relationship
612 between sleep disorders and suicidal behaviour in patients with depression. *BMC*
613 *Psychiatry.* 2019;19:303. <https://doi.org/10.1186/s12888-019-2302-5>
614
615

Table 1. Participant characteristics and evaluation scale scores

	Mood disorders											
	Total n=1411	group n=417	Control group n=994	p-value	Depression group n=113	Control group n=1298	p-value	Dysthymia group n=41	Control group n=1370	p-value	Bipolar disorder group n=353	Control group n=1058
Gender												
Male (%)	1047	310(29.6)	737(70.4)		79(7.5)	968(92.5)		29(2.8)	1018(97.2)		266(25.4)	792(74.6)
Female (%)	364	107(29.4)	257(70.6)	0.94	34(9.3)	330(90.7)	0.28	12(3.3)	352(96.7)	0.61	87(23.9)	265(76.1)
Age (years)	40.1±10.3	38.0±10.1	41.0±10.3	<0.001	37.0±10.0	40.4±10.3	<0.005	41.2±9.9	40.1±10.3	0.47	37.9±10.0	40.1±10.3
Consecutive service(years)	13.3±9.6	12.3±9.2	13.7±9.8	<0.01	12.7±9.4	13.3±9.6	0.51	16.9±10.5	13.2±9.6	<0.05	12.1±9.1	13.3±9.6
CES-D (points)	14.1±8.3	18.4±10.2	12.3±6.6	<0.001	27.7±10.2	12.9±6.9	<0.001	30.3±10.4	13.6±7.7	<0.001	16.9±9.7	13.6±7.7
BSDS (points)	4.8±2.4	6.0±3.2	4.4±1.7	<0.001	6.8±3.8	4.7±2.1	<0.001	6.7±4.0	4.8±2.3	<0.001	6.0±3.2	4.8±2.3
LSAS (points)	39.9±28.2	47.3±29.4	36.7±27.1	<0.001	58.9±30.1	38.2±27.4	<0.001	58.9±31.9	39.3±27.9	<0.001	45.3±29.1	39.3±27.9
SDISS1 (points)	1.8±2.1	2.8±2.4	1.4±1.7	<0.001	4.5±2.5	1.6±1.8	<0.001	5.4±2.5	1.7±2.0	<0.001	2.5±2.3	1.7±2.0
SDISS2 (points)	1.6±2.0	2.5±2.3	1.2±1.6	<0.001	3.9±2.4	1.4±1.8	<0.001	5.0±2.5	1.5±1.9	<0.001	2.3±2.3	1.5±1.9
SDISS3 (points)	1.4±1.9	2.1±2.3	1.1±1.6	<0.001	3.2±2.7	1.2±1.7	<0.001	4.0±2.8	1.3±1.8	<0.001	2.1±2.2	1.3±1.8

Evaluation scales: The Center for Epidemiological Studies-Depression (CES-D), Bipolar Spectrum Diagnostic Scale (BSDS), Liebowitz Social Anxiety Scale - Japanese version, and Sheehan Disability Scale (SDISS)

Table 2. Group comparisons on MINI items

	Total	Mood disorder group	Control group	Gross odds ratio	95% confidence interval	p-value	Depression group	Control group	Gross odds ratio	95% confidence interval	p-value	Dysthymia group	Control group	Gross odds ratio	95% confidence interval	p-value
	n=1411	n=113	n=1298				n=113	n=1298				n=41	n=1370			
A Depression	113	-	-	-	-	-	-	-	-	-	-	23	90	18.2	9.5-34.9	<0.001
A1	64	-	-	-	-	-	-	-	-	-	-	21	43	32.4	16.4-64.2	<0.001
A2	88	-	-	-	-	-	-	-	-	-	-	15	73	10.3	5.2-20.2	<0.001
B1 Dysthymia group	41	-	-	-	-	-	23	18	18.2	9.5-34.9	<0.001	-	-	-	-	-
D Bipolar disorder group	353	-	-	-	-	-	55	298	3.2	2.2-4.7	<0.001	21	332	3.3	1.8-6.1	<0.001
D1 High-spirited group	218	-	-	-	-	-	28	190	1.9	1.2-3.0	<0.01	13	205	2.6	1.3-5.2	<0.005
D2 Increased irritability group	216	-	-	-	-	-	40	176	3.5	2.3-5.3	<0.001	19	197	5.1	2.7-9.7	<0.001
E1 Panic disorder group	45	10	35	9.0	4.4-18.4	<0.001	17	28	8.0	4.2-15.2	<0.001	7	38	7.2	3.0-17.3	<0.001
F1 Agoraphobia group	150	55	95	5	3.5-7.2	<0.001	38	112	5.4	3.5-8.3	<0.001	11	139	5.4	1.6-6.6	<0.001
G1 Social anxiety disorder group	142	92	50	5.3	3.7-7.7	<0.001	42	100	7.1	4.6-10.9	<0.001	16	126	6.3	3.3-12.1	<0.001
O Generalized anxiety disorder group	157	100	57	5.2	3.7-7.4	<0.001	49	108	8.4	5.5-12.9	<0.001	24	133	13.1	6.9-25.1	<0.001
H Obsessive compulsive disorder group	109	74	35	5.9	3.9-9.0	<0.001	41	68	10.3	6.5-16.2	<0.001	19	90	12.3	6.4-23.5	<0.001
H1 Obsession group	71	53	18	7.9	4.6-13.7	<0.001	35	36	15.7	9.4-26.4	<0.001	19	52	21.9	11.2-42.9	<0.001
H2 Obsessive behavior group	64	41	23	4.6	2.7-7.8	<0.001	17	47	4.7	2.6-8.5	<0.001	7	57	4.7	2.0-11.2	<0.001
I Post-traumatic stress disorder group	204	96	108	2.5	1.8-3.3	<0.001	31	173	2.5	1.6-3.8	<0.001	12	192	2.5	1.3-5.1	<0.01
I1 Traumatic experience group	201	93	108	2.4	1.7-3.2	<0.001	26	175	1.9	1.2-3.1	<0.05	9	192	1.7	0.8-3.7	0.152
I2 Sense of powerlessness/fear group	98	56	42	3.5	2.3-5.3	<0.001	18	80	2.9	1.7-5.0	<0.001	6	92	2.4	1.0-5.8	<0.05
I3 Flashback group	18	14	4	8.6	2.8-26.3	<0.001	12	6	25.6	9.4-69.6	<0.001	7	11	25.4	9.3-69.6	<0.001
J Alcohol misuse group	726	240	486	1.4	1.1-1.8	<0.005	59	667	1.0	0.7-1.5	0.87	20	726	0.9	0.5-1.7	0.728
K Drug misuse group	7	5	2	6.0	1.2-31.2	<0.05	4	3	15.8	3.5-71.7	<0.001	2	5	14	2.6-74.4	<0.001

L Psychotic disorder group	62	39	23	4.4	2.6-7.4	<0.001	17	45	4.9	2.7-8.9	<0.001	8	54	5.9	2.6-13.4	<0.001
M3 Anorexia mentalis group	63	22	41	1.3	0.7-2.2	0.206	10	53	2.3	1.1-4.6	<0.05	5	58	3.1	1.2-8.3	<0.05
N Bulimia nervosa group	280	151	129	3.8	2.9-5.0	<0.001	48	232	3.4	2.3-5.1	<0.001	16	264	2.7	1.4-5.1	<0.005

MINI: Mini-International Neuropsychiatric Interview

Table 3. Multivariate analysis results

	Mood disorders group			Depression group			Dysthymia group			Bipolar disorder group		
	Adjusted	95%	p-value	Adjusted	95%	p-value	Adjusted	95%	p-value	Adjusted	95%	p-value
	odds ratio	confidence interval		odds ratio	confidence interval		odds ratio	confidence interval		odds ratio	confidence interval	
Panic disorder group	3.19	1.42-7.17	<0.05	2.39	1.06-5.36	<0.05	1.94	0.62-6.02	0.25	2.51	1.24-5.09	<0.05
Agoraphobia group	2.10	1.36-3.23	<0.01	1.38	0.78-2.45	0.28	0.55	0.21-1.44	0.22	1.89	1.24-2.87	<0.005
Social anxiety disorder group	2.62	1.71-4.02	<0.001	2.74	1.61-4.67	<0.001	2.16	0.92-5.05	0.08	1.83	1.21-2.77	<0.005
Obsessive compulsive disorder group	2.10	1.26-3.47	<0.005	3.59	2.02-6.38	<0.001	5.10	2.07-12.56	<0.001	1.16	0.71-1.90	0,55
Post-traumatic stress disorder group	1.69	1.20-2.39	<0.005	1.20	0.69-2.07	0.52	1.07	0.44-2.60	0.88	1.70	1.21-2.40	<0.005
Anorexia mentalis group	1.13	0.62-2.06	0.70	2.00	0.86-4.65	0.11	3.33	1.01-11.00	<0.05	0.83	0.44-1.57	0.57
Bulimia nervosa group	2.78	2.04-3.78	<0.001	1.77	1.08-2.90	<0.05	1.33	0.59-3.02	0.50	2.32	1.70-3.15	<0.001
Generalized anxiety disorder group	1.75	1.14-2.69	<0.05	2.72	1.57-4.72	<0.001	6.97	3.01-16.16	<0.001	1.36	0.89-2.08	0.15
Psychotic disorder group	1.60	0.25-10.12	0.62	5.09	0.85-30.56	0.08	6.02	0.72-50.25	0.10	0.67	0.11-3.97	0.66
Drug misuse group	1.77	0.93-3.38	0.08	0.99	0.44-2.21	0.98	0.64	0.20-2.06	0.45	1.96	1.06-3.60	<0.05
Age	0.99	0.98-1.00	0.15	0.99	0.97-1.01	0.40	1.05	1.01-1.08	0.01	0.99	0.97-1.00	<0.05
Constant	0.30		<0.001	0.05		<0.001	0.01		<0.001	0.33		<0.001