

Posttraumatic stress disorders in the Nanai after pollution of the Amur River: ethnocultural analysis

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Abstract

Objectives Chemical pollution of the Amur River has seriously damaged traditions and caused posttraumatic stress disorder (PTSD) among the Nanai, the indigenous people living along this river. This study was performed to clarify the ethnographic characteristics of PTSD in this unique population.

Methods The study group consisted of 75 male and 112 female randomly selected volunteers. PTSD severity measured using scores of the Impact of Event Scale – Revised (Total-I) and Clinical-Administered PTSD Scale (Total-C) was estimated according to demographic and ethnocultural backgrounds, clinical status, and ethnopsychological attitudes toward the Amur River.

Results The differences in averages of Total-I and Total-C were not always the same in the groups divided by ethnographic information. Logistic regression analysis with a dependent variable, possibly without PTSD (Total-I <34 and Total-C <40)/possibly with PTSD (either Total-I \geq 34

or Total-C \geq 40), and categorical independent variables using ethnographic information extracted a low score when ‘priority values’ and ‘the Amur River for me is’ was “profession” and a high score when ‘dominant role in spousal relationship’ was “self,” when ‘predominant forms of response in stressful situations’ was “try to organize,” when ‘preferred method of medical treatment’ was specific for the Nanai, when “rely on something mystical” was manifested, and when the Amur River was believed to be “sacred”.

Conclusion Those with a pragmatic attitude were less likely to have PTSD. However, those who were required to make decisions within close relationships and were intimate with the Nanai tradition and the Amur River had increased likelihood of PTSD.

Keywords Indigenous people Nanai · Posttraumatic stress disorders (PTSD) · Impact of Event Scale – Revision (IES-R) · Clinical-administered PTSD Scale (CAPS) · Ethnocultural analysis

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Introduction

The Nanai is a small population of indigenous people in the Russian Far East, living along the middle reaches of the Amur River Valley. Their culture and language include Tungusic (Ewenki), aboriginal Nivkh, and Chinese–Manchu elements. They have their own independent culture and live by fishing in the Amur River and hunting in the local forest. In December 2005, an accident at a chemical factory caused the release of toxic substances into the Songhua River (Jilin, China), which polluted the Amur River in Russian territory [1]. This serious pollution of river water with benzene and nitrobenzene [2] resulted in the

prohibition of fishing. Forest fires have significantly reduced the forest area, which has already led to a change in climate and the hydrological regime of the Amur River, and a dramatic reduction in the number of game animals, thus disrupting the way in which the Nanai obtain their staple food, as well as their traditional activities.

This population has always regarded the Amur River as part of their ethos, symbolic culture, and inner world [3]. They have a shamanistic religion with great reverence for the bear and fire. Fire is personified as an elderly woman. Young children are prohibited to run up to the fire in order not to startle her, and men always show respect in the presence of a fire. The Nanai consider that everything in the universe possesses its own spirit that wanders independently throughout the world, whether it is good or evil. They worship the spirits of the sun, the moon, the mountains, the water, and the trees.

In addition, they believe that their ancestors originated from the Amur River, which is also the guide to the spirit world after death. These characteristic beliefs may lead to catastrophic results in this case. The disaster began suddenly. However, pollutants settled to the riverbed and froze into ice, and so their toxicities had prolonged stressful effects, leading to chronic trauma, disadaptation, and feelings of powerlessness regarding the situation among the Nanai.

More than two-thirds of the general population may experience a significant traumatic event at some point in their lives, and therefore traumatic experiences are relatively common [4]. Such environmental factors are potential sources of tense social situations and inducers of physical and mental pathologies. There have been a number of studies of disaster victims and they displayed a variety of sample types, disaster types, disaster locations, outcomes and risk factors observed, and overall severity of impairment [5–11]. There have also been a number of reviews analyzing the potential range, magnitude, and duration of the effects of a disaster, as well as the experiential, demographic, and psychosocial factors that may influence the mental health of the stricken community [12–15]. Among them, posttraumatic stress disorder (PTSD) is the most commonly studied and probably the most frequent and debilitating psychological disorder [4, 13, 15], because it is the only psychiatric disorder that has an etiological component, that is, exposure to a traumatic event. It has been documented that manmade/technological disasters may have different and more marked consequences than natural disasters [13–15]. In addition, more severe exposure, female gender, middle age, ethnic minority status, secondary stressors, prior psychiatric problems, and weak or deteriorating psychosocial resources have been reported to increase the likelihood of adverse outcomes [13–15]. Therefore, it is possible that the long-lasting pollution of the Amur River may have serious adverse effects on the

Nanai people. However, their own tradition and culture may exert either protective or risk factors. Ethnographic research with native communities is needed for the development of effective diagnostic measures and mental health interventions for clinical practice [16].

Therefore, we explored the relationship between seriousness of PTSD in the Nanai people and their ethnographic information, such as demographic and ethnocultural backgrounds, clinical status, and ethnopyschological attitudes toward the Amur River, to clarify the specific characteristics of PTSD in this unique population ethnographically.

Subjects and methods

Subjects

The participants in this study were selected randomly and included 187 indigenous adult Nanai volunteers over 18 years old (the age at which an individual does not require a guardian, according to the laws of the Russian Federation) from the general civilian population in the eight villages of Nanai Regional District of Khabarovsk Territory located in the Far East of the Russian Federation.

The field-type survey was performed by visiting the yards in residential areas of the participants during the daytime (usually between 09:00 and 18:00). The survey was carried out during winter and spring 2006 with the ecological catastrophe. Two medical doctors trained in the specifics of PTSD research conducted the interviews under the supervision of the senior interviewer. This study was conducted with all participants' written informed consent regarding all procedures. The questionnaires were assigned identity (ID) numbers to protect the identities of the participants. The study design was approved by the Ethical Committee of Kanazawa University School of Medicine (Japan) and the Ethical Committee of Far Eastern State Medical University (Russian Federation).

PTSD examinations

All participants were asked to complete written questionnaires designed according to the Russian language certified version [17] of the Impact of Event Scale – Revision (IES-R) [18] and to have an interview according to the Clinical-administered PTSD Scale (CAPS) [19, 20] for PTSD examination.

IES-R (Russian language certified version)

IES-R consists of 22 items based on self-reports that can be answered with 0, 1, 3, and 5 points for the answers “no,”

“rarely,” “sometimes,” and “often,” respectively. These items were separated into three categories that can identify trends in prevalence of Intrusion/Reexperience (compulsion to repeat: eight questions), Avoidance of traumatic events (seven), and Hyperarousal (physiological excitability: seven), which are included in the diagnostic criteria of PTSD in DSM-IV [21]. The total score (Total-I) range was 0–110, and several cut-off values were reported to detect symptoms indicating a risk and/or vulnerability of PTSD. A score of ≥ 20 was used to estimate the prevalence of PTSD symptoms, with higher Total-I indicating more symptoms [6, 7]. The high-risk PTSD group was also defined as those scoring ≥ 25 , based on the screening results [22, 23]. Individuals with scores ≥ 34 have been proposed to be probable PTSD cases [24]. However, Total-I can reach near 60 after torture [25].

CAPS (Russian language certified version)

Participants were presented with 17 questions to explore Intrusion (four items), Avoidance (seven), and Hyperarousal (six) that could be answered by the scheme scores for frequency and intensity. The response was scored on a five-point Likert-type scale; (i) frequency: 0 = none, 1 = rarely (0–25 % of the period), 2 = sometimes (26–50 %), 3 = often (51–75 %), and 4 = always (>75 %); (ii) intensity: 0 = no such feelings, 1 = weak intensity of symptoms, 2 = moderate intensity, 3 = high intensity, and 4 = very high intensity. Estimation of total severity scores was performed by summing the frequency and intensity ratings with Total-C ranging from 0 to 136. Total-C was classified as follows: subclinical = 0–19, mild = 20–39, moderate = 40–59, severe = 60–79, and extremely severe ≥ 80 [26].

Self-administered questionnaire

We used a self-administered questionnaire to determine participants’ demographic, ethnocultural, clinical, and ethnopsychological information. The demographic section included questions regarding gender, age, education level, profession, marital status, and housing condition.

The ethnocultural section was designed to obtain information regarding native language, relation to own and other nationalities, relation to religion, confession, forms of religious rituals (for believers), dominant role in spousal relationship, domestic atmosphere, age hierarchy, priority values (multiple-responses), observance of national ceremonies (festivals, marriage, birth, funerals), belief in national myths and omens, preferred method of medical treatment (multiple responses), and attitudes toward mental illness and suicide. The data from questions related to religion seemed not to be useful. For example, 120

participants answered that they were “nonbelievers,” but 153 answered that they had “religious rituals.” This contradiction was probably because it was prohibited to have religious beliefs during the Soviet Union period. These categories were omitted from the analysis.

The third section was related to clinical examination and included questions about psychopathological family history, psychopathological episodes, predominant forms of response in stressful situations, anxiety, sphere of psychotraumatic situation, manifestation of work disadaptation (multiple-responses), manifestation of social disadaptation (multiple-responses), and level of physical health (multiple-responses).

The fourth section dealt with ethnopsychological questions related to the Amur River and included information about inhabiting fish, water pollution, sentiment toward the Amur River (multiple responses), and plans for the future.

Analysis and statistics

The participants were divided into two or more groups based on to the responses in the self-administered questionnaire. The differences in averages of Total-I and Total-C between and among groups were examined using Student’s *t* test and one-way ANOVA with Tukey’s HSD as a post hoc test, respectively. Thus, the present study had a cross-sectional design within the Nanai people.

Thereafter, we performed logistic regression analysis with low score/high score as the dependent valuable, where a low score was the group possibly without PTSD with low Total-I and Total-C, and a high score was the group possibly with PTSD with a high score of either Total-I or Total-C. The above-mentioned groups classified by the responses to the self-administered questionnaire were used as categorical independent variables. All analyses were performed with JMP 9.0.2 (SAS Institute Inc., Cary, NY). In all analyses, $P < 0.05$ was taken to indicate statistical significance.

Results

The averages of Total-I and Total-C for all subjects were 31.5 ± 20.1 (range; 0–96) and 35.0 ± 16.2 (0–82), respectively (Table 1). Although Total-I and Total-C were significantly correlated, they were not identical. Around 42 % (79 of 187) and 36 % (67) had Total-I score ≥ 34 and Total-C score ≥ 40 , respectively (Fig. 1).

Among the groups divided by the general demographic information, the scores of ‘age group’ “18–29” tended to be lower than those of other ‘age groups,’ but the difference in Total-C between “18–29” and “30–39” alone was significant (Table 1). No other groups, including ‘gender,’

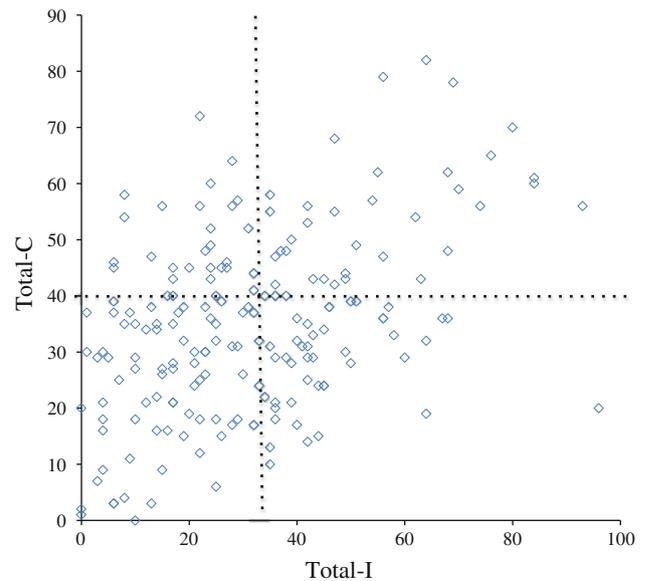
Table 1 Comparison of Total-I and Total-C between groups divided according to demographic characteristics

	No.	Total-I	Total-C
All	187	31.5 ± 20.1	35.0 ± 16.2
Gender			
Female	112	33.7 ± 22.0	36.0 ± 16.1
Male	75	28.3 ± 16.4	33.4 ± 16.4
Age class			
18–29	52	27.1 ± 19.7	29.5 ± 16.5
30–39	52	34.7 ± 23.0	38.3 ± 16.3 ^b
40–49	37	32.4 ± 15.5	35.9 ± 13.8
≥50	46	32.3 ± 20.2	36.5 ± 16.6
Housing			
Own house	140	30.4 ± 20.3	33.9 ± 16.1
State house	31	34.8 ± 18.0	38.5 ± 15.2
No house	16	35.5 ± 22.0	37.6 ± 18.9
Marital status			
Married	140	30.5 ± 19.6	35.1 ± 16.7
Not married	32	31.9 ± 18.1	33.3 ± 15.0
Widowed/divorced	15	39.9 ± 27.1	37.3 ± 14.9
Education level			
Elementary	44	35.0 ± 21.6	34.7 ± 16.2
Secondary	113	31.0 ± 19.8	35.4 ± 16.4
Higher	30	28.4 ± 18.9	33.5 ± 16.0
Profession			
Business	16	27.6 ± 18.4	29.9 ± 14.9
Related to tradition	13	29.8 ± 20.3	32.6 ± 12.4
Education	38	32.1 ± 20.0	34.6 ± 16.8
Fishery	13	23.8 ± 18.8	28.5 ± 19.0
Health case	16	32.8 ± 12.7	34.6 ± 12.1
Industry	30	27.2 ± 19.3	33.6 ± 16.3
Civil service	12	31.8 ± 17.6	39.6 ± 18.5
Not working	49	37.0 ± 23.5	39.0 ± 16.6

Values represent mean ± SD. Significant difference: ^b from the first group ($P < 0.05$, one-way ANOVA with Tucky's HSD as a post hoc test)

showed significant differences in the scores. The numbers of “related to tradition” and “fishery” in ‘profession’ were less than expected, both being 13.

In a comparison between/among groups divided according to ethnocultural information, “inferior” in ‘relation to own nationality’ resulted in a significantly higher Total-C than “equal” (Table 2). “Intolerant” in ‘relation to other nationalities’ was associated with higher scores than those of “friendly” and “tolerant,” whereas only very high Total-C (48.7 ± 16.8) showed a significant difference. Other groups, including those divided by multiple-response questions, did not show significant differences. Although comparison among groups divided by multiple-response questions was difficult, “shamanism”

**Fig. 1** Correlation of Total-I and Total-C. ($R = 0.45$, $P < 0.0001$). Dotted lines indicate the cut-off value used in logistic regression analysis

and “healing” in ‘preferred method of medical treatment’ was weakly associated with high Total-I or Total-C.

With regard to clinical status, the groups divided both by ‘psychopathological family history’ and ‘psychopathological episodes’ showed no significant differences in Total-I or Total-C (Table 3). Among the groups divided by ‘predominant forms of response in stressful situations,’ the scores of the “try to organize” group tended to be low but Total-C alone (25.9 ± 16.3) was significantly lower than in the “expressive” and “self-aggressive” groups. Regardless of being significant or not, those who had “none” in ‘sphere of psychotraumatic situation’ tended to have low Total-I and Total-C. The group “always” having ‘anxiety’ showed significantly higher Total-C than the “absent” group. Among the groups divided by multiple-response questions, the groups ‘manifesting work disadaptation,’ such as “underperformance,” and “problems in the shift,” showed high Total-C. Their combination like underperformance, mistake, and problems in the shift (U + M + S) resulted in higher Total-I (47.5 ± 25.0) and Total-C (52.2 ± 13.5). Similar tendencies were observed among the groups divided by ‘manifestation of social disadaptation’ and ‘physical health.’

Among the groups divided by ethnopsychological questions, those who felt that ‘fish caught in the Amur River is’ “neither basic nor important” displayed low Total-I and Total-C compared to “basic and important,” although the difference was not always significant (Table 4). The group responding that ‘water pollution in the Amur River is’ “not terrible” had significantly lower Total-I and Total-C than the “disaster” group. Effects of

Table 2 Comparison of Total-I and Total-C between groups, divided according to the ethnocultural information

	No.	Total-I	Total-C
Native language			
Russian	61	27.5 ± 20.1	33.2 ± 15.8
Russian/own	126	33.5 ± 19.9	35.8 ± 16.4
Relation to own nationality			
Inferior	28	29.3 ± 19.7	41.9 ± 16.9
Equal	144	31.0 ± 19.8	33.7 ± 15.7 b
Superior	15	41.3 ± 22.2	33.9 ± 17.8
Relations to other nationalities			
Friendly	127	31.1 ± 20.1	33.3 ± 15.2
Tolerant	49	30.6 ± 19.9	36.1 ± 17.4
Intolerant	11	40.4 ± 20.7	48.7 ± 16.8 b,c
Dominant role in spousal relationship			
Self	47	34.0 ± 20.4	39.6 ± 14.5
Partner	25	33.6 ± 19.7	36.1 ± 16.5
Parity	68	28.7 ± 20.9	32.2 ± 18.3
Not married	47	32.1 ± 18.9	33.7 ± 13.7
Age hierarchy			
Respect but not subordinate	171	31.5 ± 20.5	34.7 ± 16.0
Subordinate	10	30.6 ± 15.8	35.3 ± 19.3
Indifferent	6	35.2 ± 14.9	42.7 ± 17.8
Domestic atmosphere			
Conflicts (–)	120	30.5 ± 20.2	33.0 ± 26.0
Conflicts (+)	67	33.3 ± 19.9	38.4 ± 16.2
Priority values^a			
Family (F)	67	34.0 ± 22.3	31.1 ± 16.5
Profession (P)	14	39.8 ± 17.0	31.6 ± 14.2
Health (H)	26	31.8 ± 15.7	38.1 ± 16.6
Material well-being (M)	22	23.6 ± 7.0	32.7 ± 14.4
Public recognition (R)	5	40.2 ± 29.9	44.6 ± 9.8
F + H	14	39.8 ± 17.0	38.1 ± 12.5
F + P	19	26.8 ± 15.6	34.8 ± 11.8
F + M	13	33.8 ± 25.0	44.1 ± 22.0
Other combination	20	30.1 ± 17.9	37.9 ± 16.1
Observance of national ceremonies			
Negative	57	33.2 ± 21.9	34.8 ± 17.7
Positive	65	32.8 ± 18.9	33.6 ± 17.3
Indifferent	65	28.8 ± 19.6	36.5 ± 13.8
Belief of national myths and omens			
Realistic	138	30.8 ± 19.9	35.5 ± 16.6
Superstitious	49	33.7 ± 20.7	33.3 ± 15.2
Preferred method of medical treatment^a			
Official (O)	80	30.6 ± 23.1	30.8 ± 16.5
Shamanism (S)	4	36.0 ± 11.1	47.3 ± 21.3
Traditional (T)	5	32.8 ± 24.0	35.0 ± 23.3
Healing (H)	5	39.6 ± 23.0	32.0 ± 18.2
O + S	29	30.7 ± 17.3	40.5 ± 16.2
O + T	50	31.1 ± 17.4	34.0 ± 11.7

Table 2 continued

	No.	Total-I	Total-C
Other combinations	14	35.4 ± 18.4	48.0 ± 14.4
Attitude to mental illness			
Civilized	117	31.7 ± 19.5	34.4 ± 16.7
Mystical	12	34.9 ± 17.9	30.2 ± 15.1
Negative	15	28.1 ± 22.5	35.9 ± 15.6
Uncertain	43	31.4 ± 21.9	37.4 ± 15.5
Attitude to suicide			
Without the possibility	152	30.5 ± 18.8	33.5 ± 15.7
Approve as a way out of intractableness	12	33.3 ± 24.5	43.0 ± 14.9
With the possibility	23	37.2 ± 25.4	40.6 ± 18.2

^a Multiple-response questions

Values represent mean ± SD. Significant difference, *P* < 0.05, *b* from the first group, *c* from the second group (*P* < 0.05, one-way ANOVA with Tucky’s HSD as a post hoc test)

‘the Amur River for me is’ on Total-I than Total-C were more complex. For example, “to obtain food” had a significant higher Total-I (43.7 ± 21.2) than “a way of business” (24.8 ± 15.2), whereas a combination of “a way of business” and “to obtain food” (B + F) displayed lower Total-I (19.4 ± 14.0) than “a way of business” alone. In addition to such difficulties in average comparison for multiple-response questions, average comparison between/ among groups was not always the same between Total-I and Total-C. Therefore, we applied logistic regression analysis.

The participants were separated into two groups, that is, the group with Total-I <34 and Total-C <40 (*n* = 77, approx. 40 %; low score), and the group with either Total-I ≥34 or Total-C ≥40 (*n* = 110, approx. 60 %; high score). The dependent variable, that is, low score/high score, was analyzed in the above-mentioned groups (Tables 1–4) as categorical independent variables. Odds values >1 and <1 represent the likelihood of being a low score and a high score, respectively. We omitted ‘marital status’ and ‘sphere of psychotraumatic situation’ because they showed high colinearity with ‘dominant role in spousal relationship’ and ‘priority values,’ respectively.

None of the determinants from demographic information was extracted, including ‘gender’ and ‘age class’ (Table 5). From the ethnocultural information, ‘dominant role in spousal relationship’ was extracted. “Parity” compared to “not married” (odds: 5.86) showed a likelihood of being a low score, and “self” compared to “partner” (0.14) and “parity” (0.07) being a high score. The odds of “profession” in ‘priority values’ to be in a low score were as high as 15.91. Both “positive” and “negative” in ‘observance of national ceremonies’ led to a high score

Table 3 Comparison of Total-I and Total-C between groups, divided according to the clinical status

	No.	Total-I	Total-C
Psychopathological family history			
None	125	30.7 ± 19.5	35.1 ± 15.8
Yes	62	34.7 ± 21.3	34.6 ± 15.8
Psychopathological episodes			
None	137	31.2 ± 20.7	33.1 ± 15.6
Organic type	24	34.8 ± 19.8	39.0 ± 16.8
Affective type	26	30.3 ± 17.5	40.8 ± 13.4
Predominant forms of response in stressful situations			
Try to organize	33	24.8 ± 16.0	25.9 ± 16.3
Autistic	22	31.9 ± 22.8	36.5 ± 20.2
Expressive	60	31.8 ± 21.7	35.9 ± 14.0 b
Self-aggressive	72	34.3 ± 19.2	37.8 ± 15.5 b
Sphere of psychotraumatic situation			
Family	72	36.8 ± 20.7	38.4 ± 14.2
Profession	43	26.8 ± 18.0	36.4 ± 14.3
Both	11	33.7 ± 26.7	41.5 ± 16.9
Ecology	38	31.7 ± 19.7	33.9 ± 16.5
None	23	22.6 ± 14.9 b	19.9 ± 17.1 b,c,d,e
Anxiety			
Absent	26	27.5 ± 19.0	26.9 ± 20.3
Situational	123	31.1 ± 18.7	34.7 ± 13.7
Always	38	35.7 ± 24.6	41.2 ± 18.4 b
Manifestation of work disadaptation ^a			
None	110	30.9 ± 19.4	28.9 ± 14.3
Underperformance (U)	13	29.0 ± 26.1	43.7 ± 16.7 b
Mistake (M)	18	23.4 ± 14.9	39.3 ± 16.0
Problems in the shift (S)	10	31.7 ± 19.6	46.5 ± 14.9 b
U + M + S	11	47.5 ± 25.0 d	52.2 ± 13.5 b
Other combinations	25	31.7 ± 19.6	41.7 ± 13.4 b
Manifestation of social disadaptation ^a			
None	69	30.5 ± 18.7	26.8 ± 14.1
Loss of interest (L)	17	25.8 ± 18.7	30.3 ± 19.2
Conflict/aggression (C)	31	26.8 ± 16.8	41.7 ± 15.0 b
Rely on something mystical (M)	6	31.0 ± 15.8	31.8 ± 7.9
Antisocial behavior (A)	4	25.0 ± 18.3	24.0 ± 11.0
L + C	19	31.2 ± 24.2	40.3 ± 15.6 b
L + C + M	13	35.1 ± 20.6	45.5 ± 14.5 b
Other combinations	28	42.4 ± 20.6	43.4 ± 7.9 b
Physical health ^a			
Healthy (H)	75	27.5 ± 16.1	29.2 ± 13.8
Subclinical (S)	62	34.4 ± 21.5	37.5 ± 15.7 b
Disorder (D)	12	33.2 ± 30.8	39.2 ± 17.9
H + newly occurred (N) + aggravation (A)	8	32.9 ± 25.5	32.3 ± 27.3
S + N	16	37.4 ± 20.8	46.0 ± 12.7 b

Table 3 continued

	No.	Total-I	Total-C
Other combinations	14	31.7 ± 17.5	38.6 ± 15.2

^a Multiple-response questions

The values represent the mean ± SD. Significant difference: *b* from the first group, *c* from the second group, *d* from the third group, *e* from the fourth group. ($P < 0.05$, one-way ANOVA with Tucky's HSD as a post hoc test)

Table 4 Comparison of Total-I and Total-C between groups divided according to the ethnopsychological questions

	No.	Total-I	Total-C
As a food, fish caught in the Amur River is			
Basic and important	60	36.5 ± 21.2	38.7 ± 15.4
Not basic but important	95	30.0 ± 18.2	34.5 ± 16.2
Neither basic nor important	32	26.8 ± 21.8	29.2 ± 16.3 b
Fish inhabiting the Amur River is seriously suffered			
No	21	34.8 ± 23.8	35.9 ± 18.1
Yes	166	31.1 ± 19.6	34.8 ± 16.0
After the pollution, do you eat fish in the Amur River?			
Yes	103	29.5 ± 18.7	34.8 ± 14.6
Yes, will not	17	35.5 ± 20.5	38.9 ± 11.1
No, will	11	42.9 ± 18.2	40.1 ± 16.2
No	56	31.9 ± 22.3	32.4 ± 19.7
Water pollution in the Amur River is			
Disaster	172	32.7 ± 20.1	36.5 ± 15.6
Not terrible	15	17.9 ± 13.7 a	17.2 ± 11.9 a
The Amur River for me is ^a			
Sacred (S)	16	38.3 ± 18.7	35.8 ± 20.2
Gateway to the ancestor/ another world (G)	25	29.4 ± 21.5	32.1 ± 17.7
A way of business (B)	19	24.8 ± 15.2	32.3 ± 12.9
To obtain food (F)	27	43.7 ± 21.2 d	39.6 ± 11.4
Just a river	62	28.7 ± 19.6 e	34.3 ± 16.5
S + G	5	48.2 ± 20.6	39.2 ± 20.7
B + F	9	19.4 ± 14.0 e	37.3 ± 17.2
Other combinations	22	29.6 ± 18.3	35.4 ± 20.7
I will leave this area			
Planning	16	35.6 ± 22.2	34.9 ± 14.9
Not planning	171	31.2 ± 19.9	34.9 ± 16.4

^a Multiple-response question

Values represent mean ± SD. Significant difference: *a* between groups ($P < 0.05$, Students' *t* test), *b* from the first, *d* from the third, *e* from the fourth groups, respectively ($P < 0.05$, one-way ANOVA with Tucky's HSD as a post hoc test)

compared to “indifferent” (odds: 0.17 and 0.10, respectively). In the multiple responses to ‘preferred method of medical treatment,’ the existence of “shamanism” (odds: 0.12), “traditional” (0.13), and “healing” (0.03) were associated with a high score.

Table 5 Logistic regression analysis exploring possibly without PTSD versus possibly with PTSD

Independent variables	Multiple answer, if any	Comparison	Reference	Odds	<i>P</i>	95 % CI		
Demographic ethnocultural								
Dominant role in spousal relationship		Parity	Not married	5.86	0.04	1.11	38.17	
		Self	Partner	0.14	0.05	0.02	0.96	
		Self	Parity	0.07	0.00	0.01	0.33	
Priority values ^a	Profession	+	–	15.91	0.01	2.04	178.73	
Observance of national ceremonies		Positive	Indifferent	0.17	0.02	0.03	0.76	
Preferred method of medical treatment ^a	Shamanism	+	–	0.12	0.00	0.02	0.50	
		Traditional	+	–	0.13	0.00	0.03	0.48
		Healing	+	–	0.03	0.02	0.00	0.56
Clinical examination								
Predominant forms of response in stressful situations		Try to organize	Self-aggressive	0.16	0.03	0.03	0.88	
Anxiety		Always	Absent	0.07	0.02	0.01	0.64	
Manifestation of work disadaptation ^a	Problems in the shift	+	–	0.06	0.01	0.00	0.52	
Manifestation of social disadaptation ^a	Rely on something mystical	+	–	0.17	0.04	0.03	0.91	
Ethnopsychological								
The Amur River for me is ^a	Sacred	+	–	0.15	0.04	0.02	0.88	
	The main source of business	+	–	4.96	0.03	1.15	24.42	

^a Multiple-response questions

All the classifications of the groups in Tables 1–4, excluding ‘marital status’ and ‘sphere of psychotraumatic situation’, were used as categorical independent variables. The variables extracted were listed; no variable was extracted in the demographic section. The odds were expressed against the odds of the group with possibly without PTSD (Total-I <34 and Total-C <40, *n* = 77, approx. 40 %; low score)/the group possibly with PTSD (either Total-I ≥34 or Total-C ≥40, *n* = 110, approx. 60 %; high score). That is, the odds values >1 and <1 represent the likelihood of being a low score and a high score, respectively

In clinical status, “try to organize” versus “self-aggressive” in ‘predominant form of response in stressful situation’ (odds: 0.16), “always” versus “absent” in ‘anxiety’ (0.07), the existence of “problems in the shift” in ‘manifestation of work disadaptation’ (0.06), and the existence of “rely on something mystical” in ‘manifestation of social disadaptation’ (0.17) were associated with a high score. From the ethnopsychological information, ‘the Amur River for me is’ was extracted. Existence of “sacred” and “the main source of business” showed a likelihood of being a high score (odds: 0.15) and a low score (4.96), respectively.

Discussion

Both IES/IES-R and CAPS have been used in various epidemiological studies to assess the prevalence of PTSD and to estimate the frequency and intensity of individual symptoms/disorders and their impact on social activities of patients [27–29]. Total-I and Total-C of the Nanai people showed significantly strong correlations but were not

identical, which was in good accordance with a previous report [28]. However, both seemed to be high compared with previous reports [22–24, 26]. The ethnic minority status of the Nanai may increase the likelihood of adverse outcomes [13–15]. In the present cross-sectional study, inter-ethnic comparison was unavailable. Thus, to specify the characteristics of PTSD within the Nanai people, the averages of Total-I and Total-C were compared between/among the groups divided by information obtained from a self-administered questionnaire survey.

In average comparison, groups divided by demographic information showed no differences. Regarding ‘profession’, those who engaged in modern works seemed to be more than expected. In addition to the prohibition of fishing and hunting, the development and introduction of modern economical lifestyles may affect the choice of ‘profession’. In fact, there are new cities and industrial sites in the vicinity of Nanai settlements and railroads now run through the region. However, businesses and industries themselves were oriented mainly on fishing, thus their development was very low [3]. The main employment was in the social sphere, like education, civil service, and health

care. Moreover, only around 5% of the Nanais live in towns and cities and their life is still limited in the Nanai settlement. Thus, it seems also natural that groups divided by ‘profession’ displayed no significant differences, whether they are traditional or modern.

Some of the groups divided by ethnocultural, clinical status, and ethnopsychological information showed significant differences in either Total-I or Total-C. However, the differences in Total-I and Total-C were not identical. Moreover, multiple-response questions had combinations with small number of participants (“other combinations” in Tables 2–4) and therefore average comparisons were not always available. Logistic regression analysis is useful to analyze multiple-response questions as well as to remove confounding factors. Regardless of Total-I or Total-C, a high score indicated the possibility of having PTSD. Thus, the group possibly without PTSD (both Total-I and Total-C were low; low score)/group possibly with PTSD (either Total-I or Total-C were high; high score) was analyzed as the dependent variable using categories obtained by self-administered questionnaire as categorical independent variables.

Logistic regression analysis did not extract categories of demographic information. That is, although female gender was reported to increase vulnerability compared to male gender [13–15, 30, 31], neither average comparison nor logistic regression showed significant differences in the present study. The middle-aged class, which increased the scores in previous studies using logistic regression [13–15], was also not extracted. Those who were required to make decisions within close relationships seemed to have a risk to PTSD, because “self” and “not married” in ‘dominant role in spousal relationship’ displayed high scores as well as “try to organize” in ‘predominant forms of response in stressful situation.’ Although the impact of marital status on PTSD was previously reported to be ambiguous [32], “not married” was associated with high scores in the present study. Adults living in the same household reported sharing similar PTSD levels [33], but the level also seemed to be dependent on ‘role in spousal relationship.’ Such characteristics may be responsible for the discrepancies with previous reports [13–15, 30, 31].

Being pragmatic, for example, ‘priority value’ was “profession,” was associated with a low score. With regard to other ethnocultural information, ‘relation to own nationality’ and ‘relation to other nationalities’ that showed differences in average comparison were not extracted in logistic regression analysis. Further, ‘observance of national ceremonies’ and ‘preferred method of medical treatment’ were extracted. Therefore, it is possible that psychological connection to the Nanai tradition plays an important role in the score. It is still unclear why both “positive” and “negative” attitudes toward ‘observance of national ceremonies’ displayed high scores. However, “indifferent” was

at least supposed to be a pragmatic attitude displaying likelihood of having a low score. In average comparison, “loss of interest,” “conflict/aggression,” and “rely on something mystical” in ‘manifestation of social disadaptation’ participated in high scores, whereas “rely on something mystical” alone was extracted in logistic regression analysis. This finding also supports the importance of psychological connection to the Nanai tradition. It seems natural that a response of “always” regarding ‘anxiety’ showed high scores in both average comparison and logistic regression analysis. Several previous studies indicated that PTSD symptoms were strongly related to physical health problems and functional health status [14, 31, 33]. However, ‘physical health’ was not extracted in the present study.

Judging from an average comparison among the ethnopsychological questions related to the Amur River, ‘water pollution in the Amur River is’ and ‘the Amur River for me is’ seemed to affect the scores. ‘The Amur River for me is,’ but not ‘water pollution in the Amur River is,’ was extracted in logistic regression analysis. As “sacred” was associated with a high score, intimacy to the Amur River was suggested to increase the scores as well as psychological connection to the Nanai tradition. The low score in “the main source of business” also seemed to be related to pragmatic attitude.

It is suggested that the Nanai have specific spousal relationships, that those who are more pragmatic are less likely to have PTSD, and that those who are intimate to the Nanai tradition and the Amur River are likely to have PTSD. However, attitudes toward the Nanai tradition and the Amur River are specific to the Nanai. Their ethnographic information was independent and could not be compared with other ethnic groups. The development of a questionnaire suitable to identify ethnographic research with native communities is essential to incorporate a deeper understanding of culturally based reactions and responses to trauma exposure [34]. The present findings provide a means of distinguishing ethnographic information more precisely. We are currently planning to perform a follow-up investigation to clarify relationships between the scores and ethnographic specificity.

Conflict of interest We acknowledge that we have no conflict of interest.

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