

# Appearance of Sensor Aberrations among Eastern Siberia Residents under Repeated Seismic Impacts

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**Abstract**—Strong earthquakes directly affect the natural environment, engineering infrastructure, and human health (including psycho-emotional state). In 2020–2021, a series of strong seismic events occurred in the southern Baikal region; they were felt over a large area and caused widespread public outcry. The Bystraya (September 21, 2020,  $M_w = 5.6$ ), Kudara (December 9, 2020,  $M_w = 5.5$ ), and Khövsgöl (January 11, 2021,  $M_w = 6.8$ ) earthquakes provided an infrequent opportunity to collect a large amount of factual data on the psychological reactions of eyewitnesses. Among other things, the concern of the population was expressed in false reports of tangible shaking that came through the internet questionnaire posted on the website of the Baikal Branch of the Federal Research Center Geophysical Survey of the Russian Academy of Sciences (FRC GS RAS) (<http://seis-bykl.ru>). A total of 1087 responses that cannot be unambiguously associated with the date and time of instrumentally recorded earthquakes were received from August 2020 to August 2021. A content analysis of false messages indicates that, against the background of high seismic activity, the population of the region experienced a deprivation of basic needs, increased anxiety, and an unstable psycho-emotional state. The rapid spread of COVID-19 was a complicating factor contributing to the emergence of stress in the population. The consequence of this was the emergence of learned helplessness, as well as the appearance of auditory, visual, and emotional aberrations. The results obtained in this study can be used to develop preventive measures to mitigate the socio-psychological consequences of future strong earthquakes.

**Keywords:** southern Baikal region, seismic impacts, content analysis, sensory aberrations, mental health

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## INTRODUCTION

Earthquakes are among the most dangerous and destructive natural phenomena. A strong seismic impact within a very short time (almost instantly) can radically change the living conditions of a large city or region. The immediate consequences of catastrophic earthquakes include, first and foremost, the loss of life or injuries, damage or destruction to buildings and infrastructure, and economic damage. The direct consequences of an earthquake can be estimated in a relatively short time, which makes it possible to develop measures to restore normal living conditions and activities in the areas affected by seismic impact.

It is much more difficult to estimate the impact of a large earthquake in the long term; this primarily concerns the consequences of seismic impact on humans as a part of the biosphere. Among the long-term effects of natural disasters, a special place is occupied by the psycho-emotional state of people who experience traumatic stress. The stressful state caused by a

strong earthquake can become a significant factor for a long time that disrupts the daily way of life; hinders the effective implementation of professional activities; and, as a result, reduces the overall well-being of society. The experience of a strong or even moderate earthquake can contribute to the formation of post-traumatic stress disorders and an increase in migratory moods. The strength, intensity, and duration of stress, due both to the main shock itself and the long after-shock series, are of great importance.

In the published seismological literature, attention is mainly paid to the behavioral reactions of eyewitnesses immediately at the moment of the seismic shock (Slade, 1932; Alexander, 1995; Prati et al., 2012; Lindell et al., 2016; Goltz et al., 2020a, 2020b), as well as the psychogenic impact of earthquakes on the psycho-emotional state and behavior of people (Chukhrov and Chukhrova, 2010; Toktosopiev, 2021). Issues of the long-term impact of earthquakes on the psycho-emotional health of a person are considered to a much lesser extent. It is known that the bygone experience of

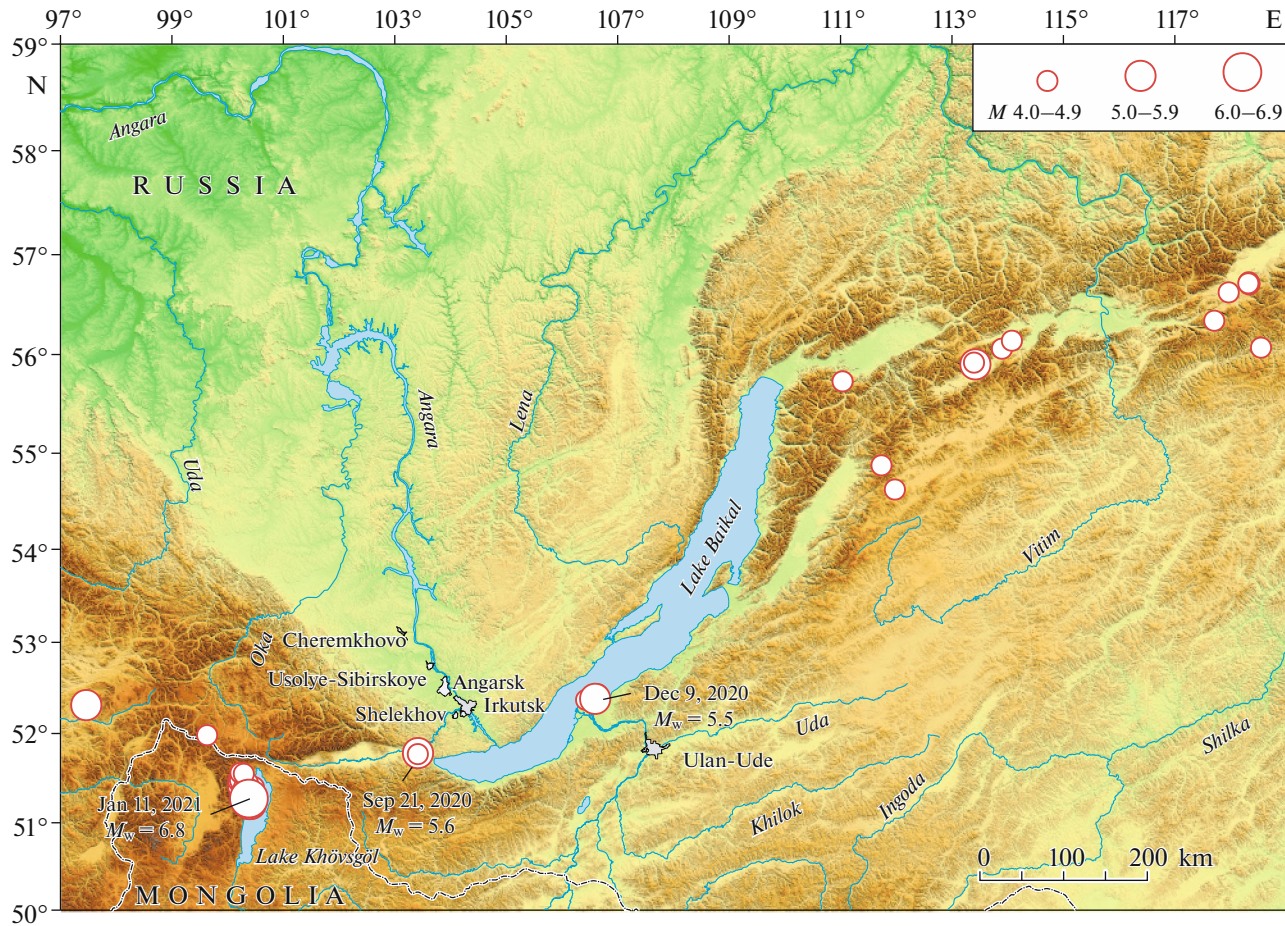


Fig. 1. Seismicity of the Baikal Rift Zone for the period from August 1, 2020 to August 31, 2021.

a strong earthquake can subsequently lead to the development of neurasthenia; psychosis; seismophobia; and, in some cases, serious nervous disorders or their exacerbation (Slade, 1933). Deviant behavior (Toktosopiev, 2021) and a general change in the psycho-emotional sphere of a person are also possible (Emel’yanova, 1996; Chukhrov and Chukhrova, 2010). In turn, a person’s mental state largely affects their ability to estimate the existing risks of earthquakes, as well as make adequate decisions in the event of a natural or man-made emergency.

In 2020–2021, a series of perceptible earthquakes occurred in the southern Baikal region (Fig. 1). The first of these events was the Bystraya earthquake on September 21, 2020 ( $M_w = 5.6$ ) (Gileva et al., 2021; Radziminovich et al., 2021; Filippova et al., 2022), which was clearly felt over a large area. Less than three months later, on December 9, 2020, the Kudara earthquake ( $M_w = 5.5$ ), comparable in magnitude and area of perceptibility zone, occurred near the Selenga River delta (Tubanov et al., 2022; Radziminovich et al., 2022). Finally, on January 11, 2021, the Khövsgöl earthquake ( $M_w = 6.8$ ) (Liu et al., 2021; Emanov et al., 2022)—the strongest in over 60 years in the

southern Baikal region—was registered in the water area of Khövsgöl Lake. All three earthquakes caused shaking intensity VI–VII MSK-64 in settlements located within near-field and were accompanied by damage to buildings, while a shaking intensity V and higher was recorded in many remote settlements, including large cities. Note that, while the Bystraya and Kudara earthquakes were accompanied by only single perceptible aftershocks, the Khövsgöl event was followed by a long aftershock sequence, which included two strong shocks on March 31, 2021 ( $M_w = 5.3$ ), and May 3, 2021 ( $M_w = 5.7$ ), as well as a large number of less strong felt seismic events.

The northeastern flank of the Baikal Rift Zone is also characterized by high seismic activity (Mel’nikova et al., 2010; Melnikova et al., 2020; Novopashina and Likhneva, 2020, 2021). During the considered period, rather strong seismic events occurred here (see Fig. 1), while some of them caused strong macroseismic effects in settlements within near-field, frightening eyewitnesses.

The increase in seismic activity occurred during the period of rapid spread of the COVID-19 coronavirus infection. The pandemic and related disruptions and

restrictions on the usual way of life created an additional negative background, which contributed to an increase in the level of anxiety in society after the seismic events.

Based on factual data, in this paper we present the results of a study of the impact of recent earthquakes in the Baikal region on the psycho-emotional health of the population and provide practical recommendations for residents to overcome the stressful situations caused by seismic impacts.

## INITIAL DATA AND RESEARCH METHODS

Materials collected using an online survey system for the population of the southern Baikal region were used as initial data. An internet questionnaire designed for the rapid collection of macroseismic data was posted on the website of the Baikal Branch of the Federal Research Center Geophysical Survey of the Russian Academy of Sciences (FRC GS RAS) in September 2008 (Radziminovich et al., 2014). The reason for its creation was the strong Kultuk earthquake on August 27, 2008 ( $M_w = 6.3$ ), which was felt in Irkutsk with intensity VI MSK-64 (Radziminovich et al., 2010). Over the next 12 years, the shaking intensity during perceptible earthquakes within the densely populated Irkutsk agglomeration did not exceed IV MSK-64. Earthquakes of moderate intensity cause a rather limited public outcry and, accordingly, a small number of responses collected after felt shocks (only a few hundred).

The situation changed radically after strong earthquakes occurred in 2020–2021, which provoked a very sharp reaction of the population of the southern Baikal region, especially for residents of large cities. In a short time after the Bystraya earthquake on September 21, 2020 ( $M_w = 5.6$ ), 3013 responses were received. The Kudara earthquake on December 9, 2020 ( $M_w = 5.5$ ), and the Khövsgöl earthquake on January 11, 2021 ( $M_w = 6.8$ ), accompanied a comparable public outcry, which made it possible to collect 1433 and 1961 reports, respectively.

The bulk of the messages about macroseismic effects are direct responses to the main shocks, as well as to their strong aftershocks. At the same time, for the period from August 1, 2020 to August 31, 2021, 1087 responses were received, which cannot be unambiguously associated with the date and time of instrumentally recorded earthquakes, information about which is promptly published on the website of the Baikal Branch of FRC GS RAS (<http://seis-bykl.ru>). We regard such false reports of seismic events that did not occur in reality as a reflection of an increased level of anxiety and fear in people. Due to the constant expectation of new seismic shocks, people mistake any fluctuation occurring for a variety of reasons, including man-made ones, as an earthquake. An analysis of the temporal dynamics of the receipt of false reports

makes it possible to establish changes in the psychological state of society after an earthquake, especially in the long term.

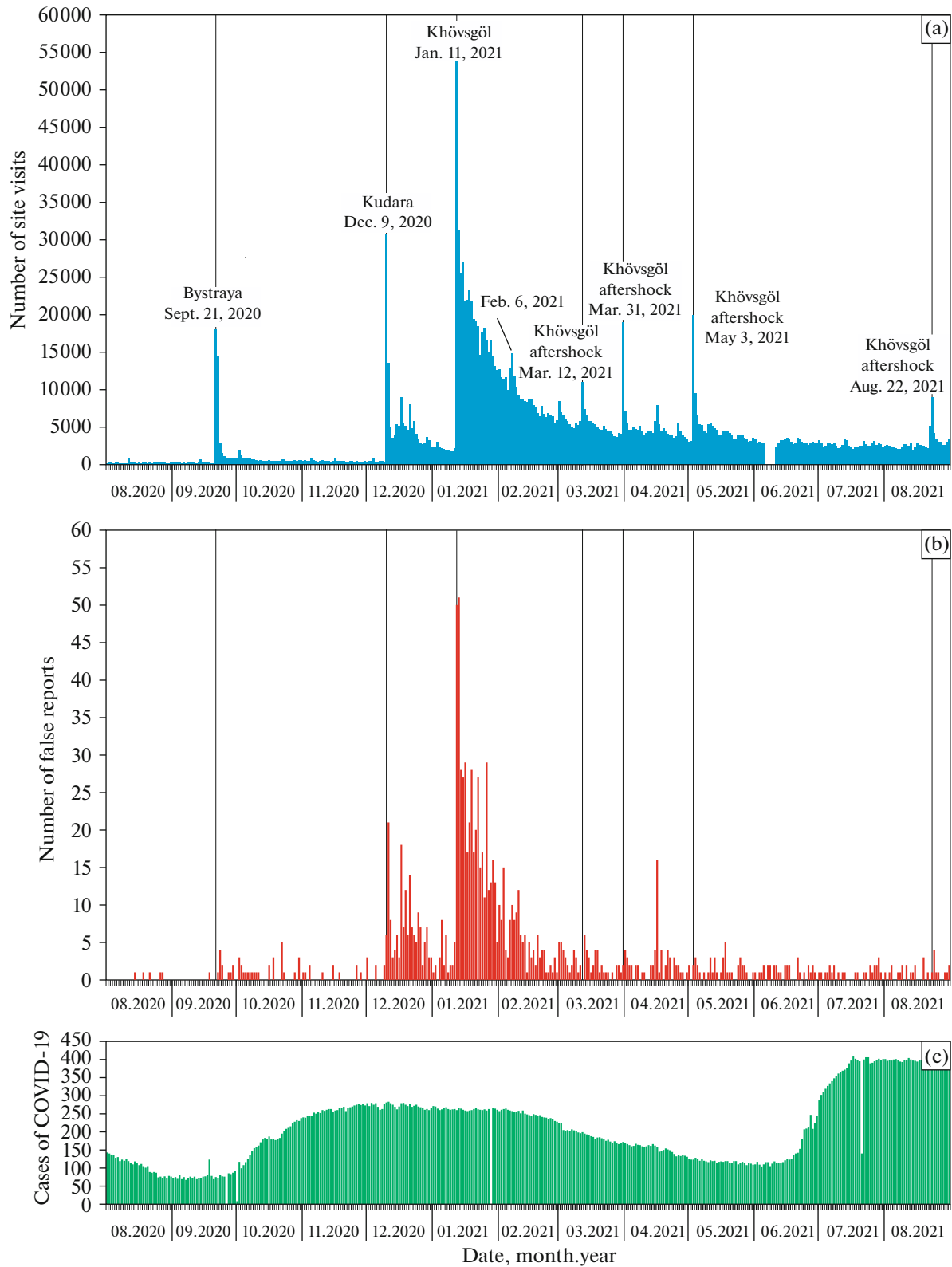
In this study, we used the methods of psychological diagnostics, in particular, content analysis. Content analysis is a method of processing text arrays for the purpose of subsequent translation of the studied information into quantitative indicators and their further statistical study. Since electronic questionnaires obtained using an interactive system for collecting macroseismic data can be considered a text array, we considered the use of content analysis to be quite acceptable for identifying sensory aberrations (disturbances in the operation of human sensory systems) of various kinds in eyewitnesses, including visual, auditory, tactile, vestibular, etc. (*Psikhoterapevticheskaya entsiklopediya...*, 2006).

Along with the analysis of false reports about the felt effects of earthquakes, we used the statistics of visits to the Internet site of the Baikal branch of FRC GS RAS for the period from August 1, 2020 to August 31, 2021. These data are statistically significant and can be considered a direct reflection of the level of interest of the residents of the southern Baikal region in up-to-date seismological information. We also analyzed the statistics on the incidence of COVID-19 in Irkutsk oblast as a kind of background or complicating factor that affects the general mental state of people and increases their vulnerability to stressful situations.

## RESULTS

The interest of the residents of Eastern Siberia in ongoing earthquakes, as well as in up-to-date seismological information, is clearly reflected in the number of visits to the website of the Baikal branch of FRC GS RAS (Radziminovich et al., 2014, 2022). In the period that precedes seismic activation in the southern Baikal region, the number of daily visits to the site usually did not exceed 200–250. On the first day after the Bystraya earthquake on September 21, 2020 ( $M_w = 5.6$ ), the number of visits to the site increased sharply and was ~18000, but then it quickly decreased to ~300 visits per day, on average (Fig. 2a). This level of attendance (with a slight decrease) persisted until the moment of the Kudara earthquake on December 9, 2020 ( $M_w = 5.5$ ), the day after which more than 30000 visits to the site were registered, as well as another ~13000 visits the next day. After that, there was a trend towards a decrease in the number of visits (with some pronounced peaks). However, their average number by the end of 2020 and in the first decade of 2021 was ~3000. This value is almost an order of magnitude higher than the average daily number of visits to the site during a period of low seismic activity.

The highest number of visits to the website of the Baikal Branch of FRC GS RAS, more than 54000, was registered during the first day after the occurrence of the Khövsgöl earthquake on January 11, 2021 ( $M_w = 6.8$ ).



**Fig. 2.** (a) Number of daily visits to the website of the Baikal Branch of FRC GS RAS, (b) daily number of false questionnaires, and (c) the incidence of COVID-19 in Irkutsk oblast for August 1, 2020–August 31, 2021 (<https://irkobl.ru/coronavirus/>).

For two months after this event, the daily number of visits to the site exceeded 5000 and then gradually decreased, remaining at the level of ~2500 until the end of August 2021.

The daily number of false reports of felt earthquakes correlates well with the schedule of visits to the website of the Baikal branch of FRC GS RAS (Fig. 2b). If in August and September 2020 such reports were sporadic and random, after the Bystraya earthquake on September 21, 2020, both their frequency and number increase. The Kudara earthquake on December 9, 2020, provoked a much more pronounced surge of false reports of felt earthquakes. Throughout the month, false reports were received almost daily, while their number on some days reached 15–20. The Khövsgöl earthquake on January 11, 2021, in combination with numerous felt aftershocks, led to an even more noticeable increase in the number of false reports compared to the Kudara event. After the Khövsgöl earthquake, false reports were received almost continuously until the end of August 2021, which is in good agreement with the statistics of visits to the site.

Thus, a series of earthquakes separated by a short time interval directly affects the increase in people's psychological discomfort and is expressed in a constant increase in the number of false reports (see Fig. 2b). This effect was especially pronounced after the Khövsgöl (third) earthquake and its aftershock sequence.

It is interesting to note that the moment of occurrence of the Bystraya earthquake on September 21, 2020, fell on the period of a slight decrease in the incidence of COVID-19 in Irkutsk oblast (Fig. 2c). The number of false reports of felt shaking that followed the Bystraya earthquake is relatively small (up to five reports per day). The Kudara earthquake on December 9, 2020, occurred against the backdrop of a new "wave" of the spread of COVID-19 and was accompanied by a significantly larger number of false reports (from 5 to 20 per day). In the same epidemiological situation, the Khövsgöl event occurred on January 11, 2021, immediately after which the number of false reports reached 30–50 per day, and they were received almost every day.

Most of the false questionnaires, as well as the true ones, accounted for the urban population, with more than half of all false responses to the residents of Irkutsk. Figures 3 and 4 clearly show that false reports of felt earthquakes came mainly from urban residents, as well as from residents of rural settlements located in close proximity to large administrative centers. This is partly due to the greater susceptibility of residents of urbanized areas to seismic shaking due to the presence of high-rise buildings and, apparently, a higher level of interest in such natural phenomena.

In multistory residential buildings, especially in high-rise buildings with 14–16 floors, even distant earthquakes of a moderate energy level are often felt. One vivid example is the aftershock sequence of the

Khövsgöl earthquake on January 11, 2021, 30 shocks of which were felt in the cities of the south of Irkutsk oblast. Against this background, eyewitnesses of real seismic impacts may develop a tendency to mistake vibrations of a different nature, for example, caused by a man-made source, for an earthquake.

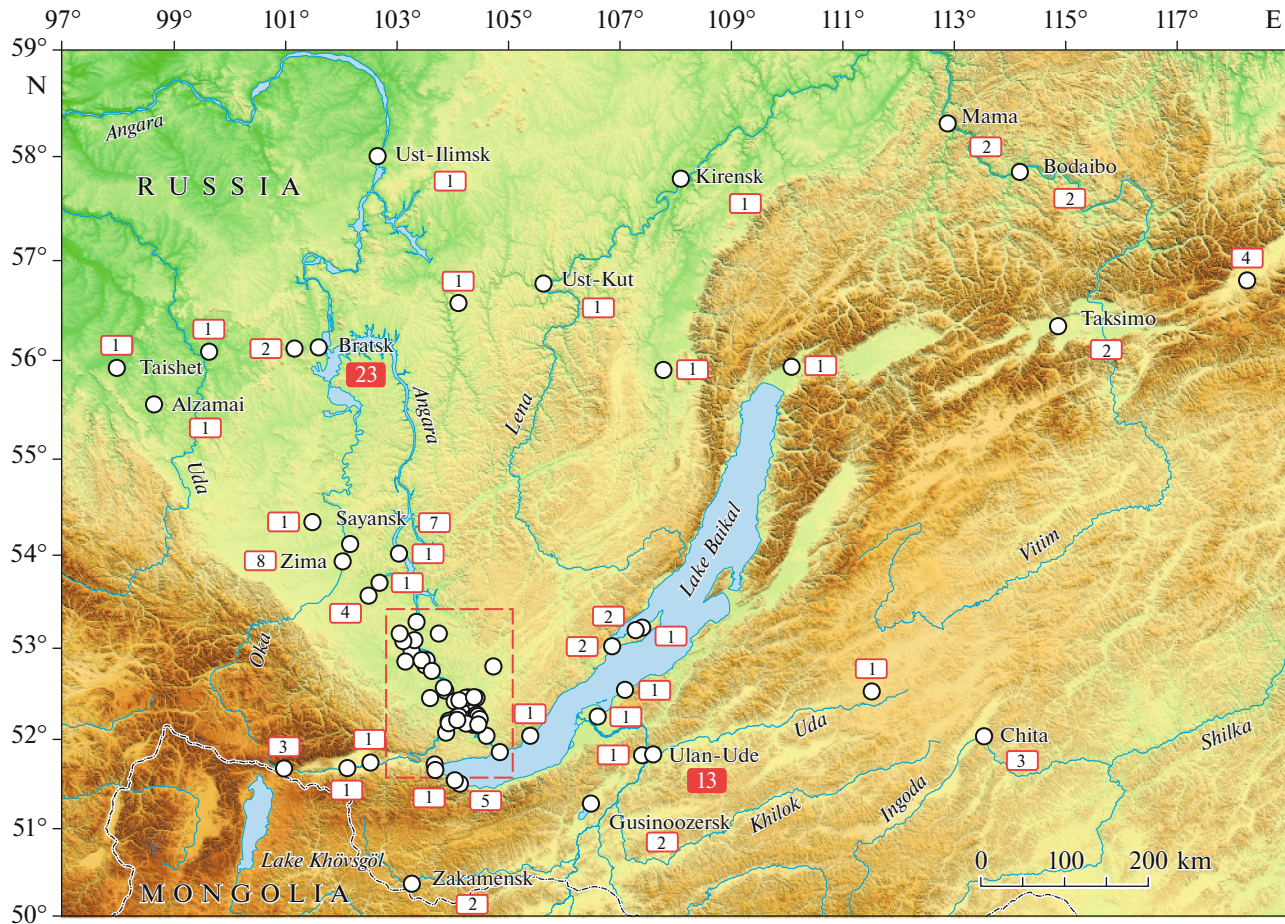
Interestingly, one common feature of false messages is the lack of an accurate address binding (street and house number) and an indication of the reaction of family members, neighbors, and colleagues. This may indicate doubts about the reality of the "earthquake." This circumstance can be explained from the standpoint of social deprivation that arose in people during the COVID-19 pandemic, which was accompanied by significant restrictions and blocking of their basic needs (communication, movement, etc.) (Ioseliani and Zaru-bina, 2021; Shilyaeva, 2021). People could not fully move around and were actually tied to their place of residence, being in forced isolation. Apparently, all this affected the development of anxiety, stress, and social deprivation of the population and manifested itself in an increase in "virtual" online activity, including on the official website of the Baikal branch of FRC GS RAS.

The use of content analysis of the data array (1087 false questionnaires) made it possible to identify certain content units, including the following types of aberrations: visual, auditory, vestibular, and emotional. As a result, estimates of the frequency of occurrence of false observations and reactions of respondents were obtained (Table 1).

According to the results, most often the respondents had emotional aberrations, although the readiness for action was mentioned only in 0.6% of the false reports. Auditory aberrations were observed in approximately 39% of cases. Vestibular aberrations are also characterized by relatively high occurrence (~32%).

Another interesting circumstance should be noted. In some questionnaires, respondents explicitly indicated that only they felt effects; their relatives, friends, or acquaintances did not notice any manifestations of the "earthquake." This can also serve as an indirect confirmation that, in reality, there was no earthquake and all the effects were illusionary.

In most cases, in false reports, eyewitnesses describe macroseismic effects corresponding to a shaking intensity from II to IV. Typical macroseismic effects include shaking of floors and walls, rattling of dishes and glasses, and rocking of furniture and hanging objects; less common are slamming of furniture and interior doors, ringing and swinging of chandeliers and pendant lamps, fluctuations in the level of liquid in the dishes, and the movement of small objects. Mostly, people "feel" vibrations they think are earthquakes while resting, while eyewitness reports often indicate awakening from shocks, oscillations or vibrations, which may indicate auditory, visual, and tactile aberrations, as well as sleep disorders among these respondents.



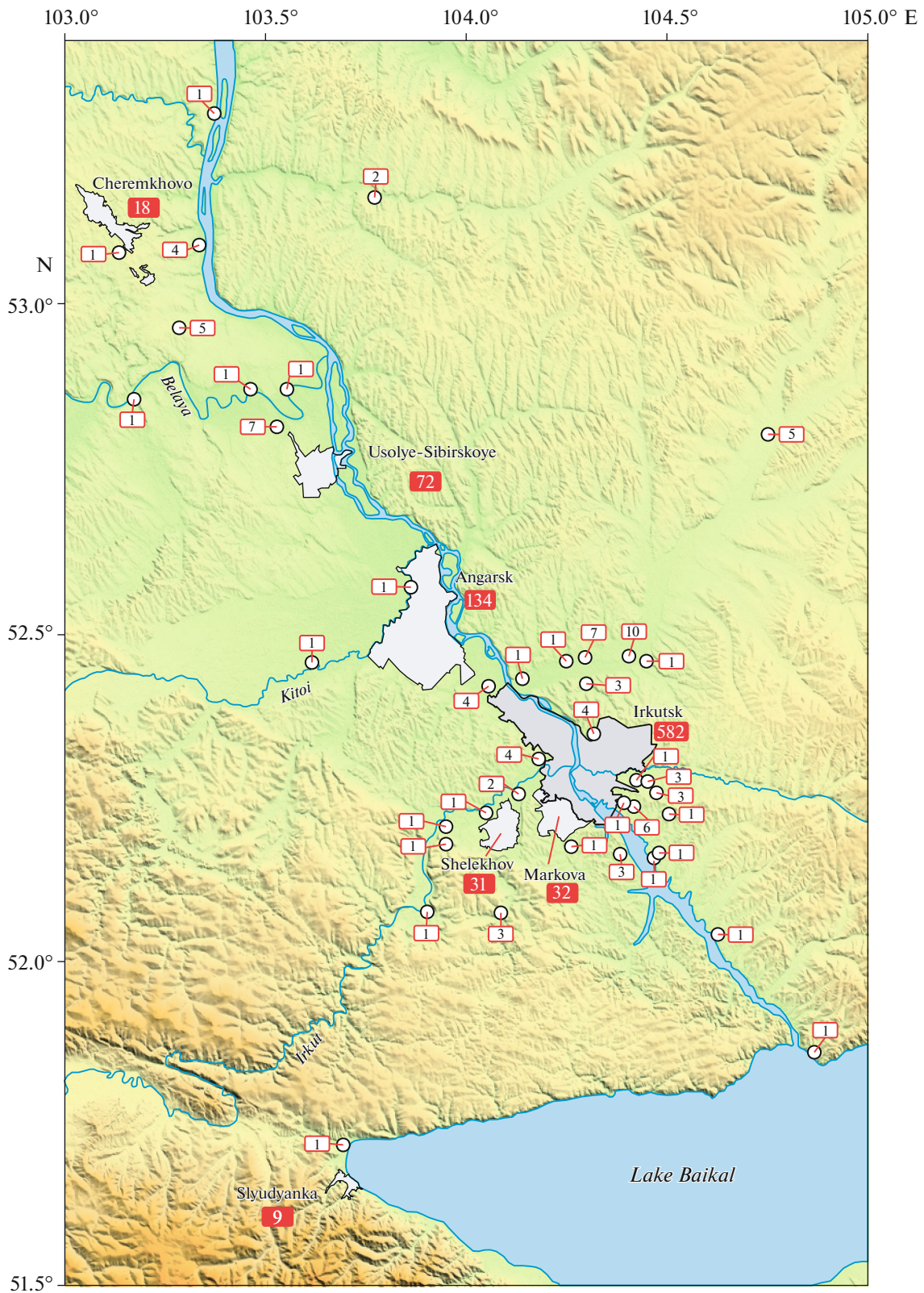
**Fig. 3.** Distribution over the area and the number of false reports of felt earthquakes received from settlements in the south of Eastern Siberia for the period from August 1, 2020 to August 31, 2021. The dotted line marks the area shown in detail in Fig. 4.

The most common symptom of most false reports is the reaction of eyewitnesses that reflects the level of fear. For example, there is a stable ratio of frightened people (10–20%) and those who did not show such a

reaction (40–60%) in all settlements with a representative number of questionnaires. Only 2–3% of respondents left their homes. Another stable sign (4% for large cities) indicated by respondents is a pro-

**Table 1.** Occurrence frequency of false observations and reactions of respondents based on the results of content analysis

Types of aberrations	False observations and reactions of respondents	Frequency of occurrence, %
Visual	Chandeliers swung	4.3
	Small objects moved	2.9
	Doors and shutters opened and closed	1.7
Auditory	Dishes, glasses, mirrors rattled	11.0
	Heard the rumble	7.7
	Floors, ceilings creaked	20.6
Vestibular	Awakened by the “earthquake”	8.3
	Furniture (sofa, bed, etc.) shook	23.9
Emotional	Did not get scared	50.0
	Scared	22.3
	Stayed in place	48.2
	Leaving or running out of houses	0.6



**Fig. 4.** Distribution over the area and the number of false reports of felt earthquakes received August 1, 2020–August 31, 2021, from large cities and rural settlements adjacent to the Irkutsk agglomeration.

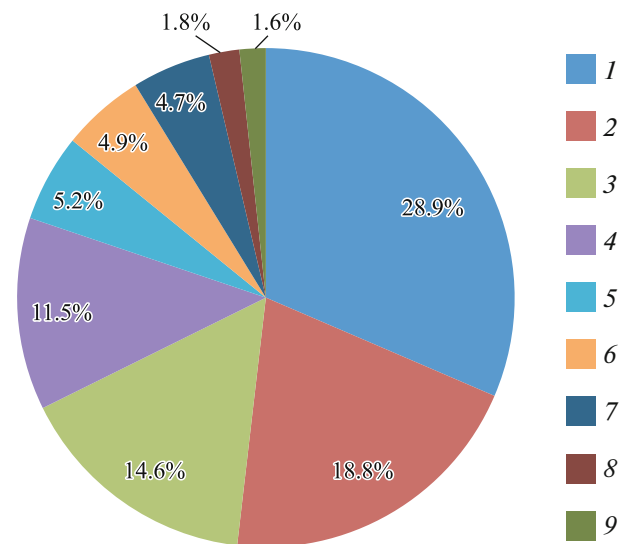
nounced reaction of domestic animals (barking dogs and restlessness of cats), while 2–3% of the questionnaires indicate the absence of the reaction of animals.

Sometimes eyewitnesses note the hum accompanying “shakings” (4–10% of the total number of false reports); 20–30% of people explicitly indicate the absence of a hum. In this regard, it is interesting to note that one of the features of the Bystraya earthquake on September 21, 2020, was prolonged and loud acoustic effects, which are mentioned by up to 60% of eyewitnesses who filled questionnaires on the website of the Baikal Branch of FRC GS RAS (Radziminovich et al., 2021). An analysis of the descriptions of the earthquake in the questionnaires shows that the main shock was preceded by a “shock” sound and, in the interval between it and the aftershock, people heard a low-frequency hum. The residents of the region, who clearly heard the hum, often describe it very emotionally and associate it with both natural and man-made sounds. Despite the variety of sound associations, prevailing types of sounds can be distinguished (Fig. 5). The sound that preceded the main shock evoked associations with road construction or military equipment moving past the house; a tractor “crashing” into the house; the operation of electrical appliances; and an explosion or blows of iron against iron. In the interval between shocks, people heard a rumble similar to the wind, the sound of a turbine, a howl, the sound of a wind musical instrument (for example, an organ). In false questionnaires, when describing their impressions, eyewitnesses also often mention a rumble, using the same associations as in a real earthquake: tractor, road equipment, aircraft turbine, wind, etc.

It is possible that the occurrence of sound aberrations is associated with the stress experienced during the Bystraya earthquake on September 21, 2020. The main role in this case could be played by the effect of the illusion of truth or the repetition effect, which leads to cognitive distortion and a tendency to believe in the reliability of information after its constant repetition and perception.

## DISCUSSION

A large number of felt earthquakes that occurred over a relatively short period could not but lead to a wide public outcry. The reaction of people to seismic impacts was expressed both in an increase in social activity online (including on the website of the Baikal Branch of FRC GS RAS) and, largely, in an increase in the number of psychological problems. Residents of the Baikal region were to some extent faced with learned helplessness. This term was introduced by M. Seligman (Peterson et al., 1993) (see also (Volkova, 2014)). In 1967, a series of experiments were conducted which led to the conclusion that helplessness arises not from the very fact of unpleasant events, but from one’s inability to control or influence these

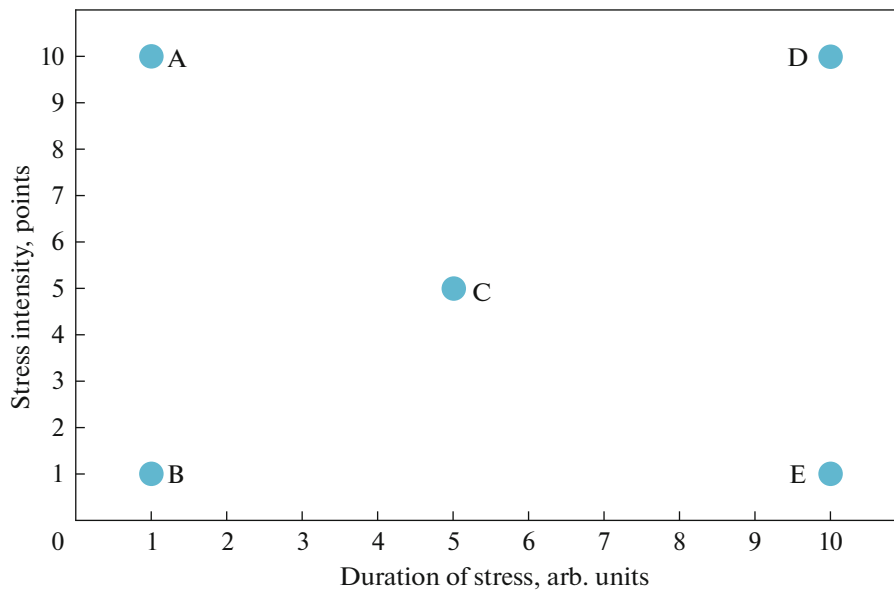


**Fig. 5.** Correlation of associations of acoustic effects of the Bystraya earthquake on September 21, 2020, with technological and natural sound sources according to eyewitness observations. (1) land transport (road construction and military equipment), (2) natural and atmospheric phenomena (storm wind, rockfalls, thunder, and water noise), (3) air transport, (4) rail transport, (5) mechanical sounds, (6) low-frequency howl, (7) electrical appliances with vibration effect, (8) sounds made by animals (roar, stomp), and (9) explosions.

events (Romek, 2000). In other words, a feeling of helplessness arises if, under conditions of stress, nothing depends on one’s actions. In this case, it is unconsciously concluded that troubles happen in and of themselves and, most importantly, it is almost impossible to influence them.

One of the reasons for the increase in the level of anxiety of people could also be the spread of the new coronavirus infection that swept the world in December 2019. COVID-19 caused global changes in various areas of human life: social, material, spiritual, and physical; it changed the quality of life of both urban and rural residents. Studies have been carried out on the impact of COVID-19 on the psyche, behavior, and psycho-emotional state of people (Kozlova et al., 2020; Dmitrieva, 2020). For example, P.R. Dmitrieva notes an increase in anxiety about social situations, the emergence of a fear of death, and a low orientation towards seeking social support (Dmitrieva, 2020). The population found itself under conditions of chronic stress, which has various signs. Long-term exposure to a stressogen (the prolonged COVID-19 pandemic and the repetition of strong seismic events that occurred in the region in a short period of time) led to a deterioration in the psycho-emotional state of people, as well as to the deprivation of basic needs. The stress theory of H. Selye (cited in (Dygalo, 2007)) describes three stages: anxiety, resistance (addiction), and exhaustion.





**Fig. 6.** Diagram-classification of traumatic stresses depending on the intensity and duration of the influence of the stressogen. (A) Acute grief (sudden, acute events, such as the death of a person, natural disasters, and earthquakes); (B) minor everyday stresses (microstresses—short and nonintense events (for example, conflicts at work)); (C) intense and prolonged stresses (crisis events); (D) acute chronic stress, such as an incurable disease or the consequences of natural disasters; and (E) chronic subtraumatic stresses.

The third stage occurs if the stressogen continues long enough (Dygalo, 2007).

It should be noted that the possible total impact of the COVID-19 pandemic and natural hazards, including earthquakes, on people's mental health is currently being widely discussed (Marko et al., 2020; Peitl et al., 2020; Finzi et al., 2021; Romić et al., 2021; Ćurković et al., 2021; Svetina et al., 2022). The reason for the emergence of this essentially new line of research was the devastating earthquake on March 22, 2020 ( $M_w = 5.4$ ), in Croatia, which occurred against the background of a rapid increase in the incidence of COVID-19 (Atalić et al., 2021). For the territory of the southern Baikal region, this problem is also quite relevant, since the residents there were exposed to the total impact of stress factors for a long time during the period of increased seismic activity in 2020–2021.

In this regard, it is of particular importance to develop practical recommendations that would allow people to adapt to new living conditions (Kiseleva et al., 2015), as well as help them cope with the consequences of stress experienced as a result of an emergency. For this purpose, we used the classification of traumatic stress (Fig. 6) depending on the intensity (strength) and duration (time) of the effect of a stressogen on a person. Due to the superimposition of two powerful stresses—the spread of the COVID-19 coronavirus infection and repeated seismic impacts—the residents of Eastern Siberia experienced various fears (in particular, seismophobia), an increase in the level of anxiety, an unstable psycho-emotional state, and

the appearance of sensory aberrations (auditory, visual, tactile, and etc.). Thus, the specifics of the occurrence of sensory aberrations in the population described here were taken as the basis for practical recommendations. It should be noted that, when a stressful situation occurs, people may show the following reactions: physiological (changes in heart rate and pressure, dizziness, etc.), behavioral (aggression, panic, withdrawal, etc.), cognitive (impaired concentration and memory, misinterpretation, negative thoughts, etc.), and emotional (anxiety, fear, anger, panic, etc.) (Fig. 7).

Our recommendations are as follows.

1. In the event of sensory sensations (visual, auditory, vestibular, etc.) due to seismic impact, it is important to make sure that the earthquake really happened. It is necessary to visit the official website of the FRC GS RAS (federal or regional) and make sure that the earthquake was registered. Social support is also of great importance (Slabinsky, 2017). If possible, you should contact someone close to you and share your experiences. Social networks can be used for this.

2. In case of physiological stress reactions, it is necessary to stabilize one's psycho-emotional state using the following methods: breathing techniques (inhale—exhale in four counts, mentally concentrating on one's breath), spontaneous relaxation using the autoregulation technique, and internal distractions (imagining scenes) or external distractions (activities which bring one pleasure) (Kiseleva and Sadovnikova, 2021).

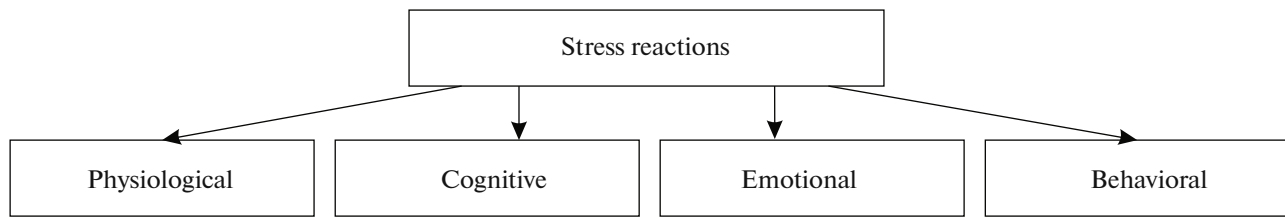


Fig. 7. Types of stress reactions.

3. In case of cognitive stress reactions, one of the most important methods of self-help is observing one's own characteristics of experiencing stress and their reflection and self-analysis (Kiseleva and Sadochnikova, 2021). Self-observation is a therapy of self-management, the awareness of one's state, which can be carried out using the Personal Explorer technique (the mental immersion of a person in their state with the help of questions: "What do I see?" "What do I hear?" "What do I feel?" "What do I want?"). Self-regulation is carried out through cognitive modes of behavior planning, reflection, and self-communication (Ababkov and Perre, 2004).

4. In case of emotional stress reactions, it is important to pay attention to the awareness of emotions and feelings, the concentration of internal sensations, and the identification of one's psycho-emotional state. There is a technique of living emotions aimed at expressing emotions through physical exercises. One of the most effective means of experiencing emotions is the method of social support, in which a person is advised to talk with someone of significance about their experiences (Romek et al., 2004).

5. In behavioral stress reactions, it is important to use self-management, self-control, and self-regulation through various techniques, such as self-instruction (mentally appealing to oneself and the use of affirmations) (Ababkov and Perre, 2004).

In the future, we plan to develop a model of psychological support for the population of Irkutsk oblast and the Republic of Buryatia upon strong seismic impacts.

## CONCLUSIONS

From 2020 to 2021, there was a superposition of two strong stresses that affected the psychological comfort of residents of the south of Eastern Siberia: repeated strong seismic impacts and the spread of several waves of coronavirus infection. The combination of these factors led to an increase in the number of panic attacks; a general increase in the level of anxiety and instability of the psycho-emotional state of citizens; and a deterioration in mental health, which, in turn, resulted in false sensations and hallucinations, as well as online activity. A pronounced increase in the number of false reports is observed from one strong earthquake to another. Thus, the repetition of seismic impacts in an explicit form

contributes to increased tension and anxiety among eyewitnesses. It should be noted that the respondents experienced fear in 22.3% of cases of false reports; this value can be considered rather high.

The deterioration of the psycho-emotional state of people manifested itself in the emergence of learned helplessness and the deprivation of basic needs. The prevalence of such manifestations made it possible to develop a preliminary package of practical recommendations for the population in order to reduce psychological discomfort. In the future, the results can be used to create a model of psychological support for the population of Eastern Siberia in natural emergencies.

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## CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest.

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